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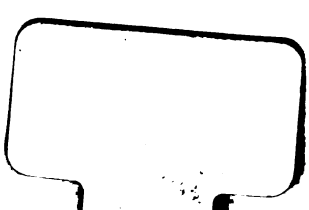

MANUAL OF DRILLS, ETC.,

FOR THE USE OF

AUXILIARY ARTILLERY.

(CONTAINING ALL DRILLS AND SUBJECTS INCLUDED IN THE "EXAMINATION FOR PROFICIENCY" OF OFFICERS AND SERGEANTS OF ARTILLERY VOLUNTEERS.)

COMPILED FROM STANDARD DRILL BOOKS, ETC., BY

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WOOLWICH:

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1874.

231. c. 171.

PREFACE.

THIS Hand-book was originally intended for the use of the 9th and 10th Kent Artillery Volunteers, but it is hoped that it may be found useful to Volunteer Artillery Corps generally, especially to Officers and Sergeants who may be qualifying themselves to pass the examination for proficiency.

The Drills have been inserted in detail from the Manual of Artillery Exercises, 1873, and, (as far as space would admit) from Field Exercise, &c., of Infantry, and Royal Artillery Manual of Carbine Exercises.

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* "Infantry Field Exercise." † "Queen's Regulations."

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† "Queen's Regulations."

ADDENDA, ERRATA, &c.

Pages 2 *and* 26.—For "Mouth of Embrasure," read "Neck of Embrasure."

Page 3, *line* 27, *and pages* 4, 27 *and* 28.—For "tubes in box,' read "tubes in box or pocket."

Page 11.—"To change Trucks, &c."

The following detail of this operation (as now laid down for drill at the Royal Military Repository) will be found more ex-

Nos. 4 and 5 apply their handspikes under rear transom, and lift up. 6 and 8 take off damaged truck and put on new one. (If left rear truck is disabled, 7 assists 8 instead of 6).

(If left rear truck is disabled, 7 assists 8 instead of 6).

To change right front truck.

No. 1.—"*Change right front truck.*"

"*Elevate.*"

2 and 3 elevate. 6 withdraws the quoin and place it as a fulcrum in front of axletree; 2 and 3 (double manned by 4 and 5) apply their handspikes over the fulcrum and under the axletree, and bear down. Other numbers as above.

If left front truck is disabled, No. 7 instead, of No. 6, assists 8 in taking off and putting on the trucks.

Page 12, *par.* 4.—The running end of the preventor rope is here directed to come off to the left, but this only applies to the case of carriages where the preventor is hooked to the rear transom : with old pattern carriages (many of which are still used by the Auxiliary Artillery) the running end should come off to the right, the hook being passed up from underneath and made fast to the front part of the carriage.

Page 53, *last par.*—"Initial Velocity," add note :—" In reports of recent experiments, the velocity with which a projectile leaves the muzzle, is more correctly termed "muzzle velocity."—(See "Proceedings of Department of Director of Artillery)."

Form of Certificate of Proficiency for Captains, Subalterns who have not attended a School of Istruction, and Sergeants of Artillery Volunteers.—From W.O. Form 581.

INFANTRY DRILL, &c.

We certify that , of the has this day been examined by us, and that he is conversant with the drill of a Company in close order, can command a guard and is acquainted with the mode of marching reliefs and posting sentries.

Also that in his written answers to questions he has expressed himself with *

---

* Here insert "clearness" or "tolerable clearness," as the case may be.

ARTILLERY DRILL, &c.

We certify that , of the is well acquainted with the carbine manual and firing exercises, and that he is also thoroughly acquainted with and capable of giving instructions in the drills of the guns used by his corps.

That he has a thorough knowledge of their ammunition, and the following methods of mounting and dismounting them.*

---

* Here insert the different methods which the Candidate has learnt.

NOTE.—These methods should include all such as can be performed with the stores issued to the corps for the purpose.

MANUAL OF DRILLS, ETC., FOR AUXILIARY ARTILLERY.

R.M.L. ORDNANCE.

64-PR. R.M.L. GUNS.

The 64-pr. R.M.L. gun in general use with volunteers is converted from the 32-pr. S.B. cast iron gun of 56 or 58 cwt. The conversion consists in boring the gun out sufficiently for a wrought iron tube to be inserted, cast iron not being strong enough to resist the increased strain to which it is subjected in a rifled gun.

Weight.—58 cwt.—Calibre 6·29 inches.

Length.—9-ft. 6-in. (measured from rear of base ring to face of muzzle).

System of Rifling.—Plain grooved, 3 grooves ; 1 twist in 40 calibres.

The projectiles used with this gun are :—

Common shell.
Shrapnel shell.
Case shot.

The weight of the charge is 8·lbs. R.L.G.

32-pr. spherical shot can be fired from this gun.

The hind sight is inclined to the left at an angle of 2° 16′ with the vertical to compensate for the lateral deviation caused by the right handed rifling.

DRILL FOR 64-PR. R.M.L. GUNS, OR THOSE OF APPROXIMATE WEIGHTS, ON COMMON STANDING CARRIAGES.*

The detachment consists of one non-commissioned officer and nine gunners, and falls in two deep to the left rear of the platform, in the position of "*Detachment Rear.*"

* From Manual of Artillery Exercise, 1873.

TO TELL OFF.

Officer.	*No.* 1.
Tell off.	

"*Tell off*" No. 1 (who is on the left of the detachment) takes a pace to his front, turns to his right, and numbers himself 1; the right-hand man of the rear rank numbers 2; the right-hand man of the front rank 3; the second man from the right of the rear rank 4; the man in his front 5, and so on; after the detachment is told off No. 1 falls in again on the left of the front rank.

TO TAKE POST UNDER COVER.

Officer.	*No.* 1.
Take post under cover.	*Right turn.* *Double march.*

"*Take post under cover*," No. 1 gives "*Right turn*," "*Double march.*" The detachment, stepping off, wheels to its left at the left corner of the platform, the front rank filing to the left of the gun, the rear rank to the right; Nos. 2 and 3 halting close to the parapet, and near the mouth of the embrasure, 4, 5, 6, and 7 forming upon their right and left in succession, and the whole turning to the right-about together. No. 1 follows in rear of the detachment, keeping under cover as much as possible; 8 and 10 go to the cartridge store, and 9 to the shell store.

The gun detachment is now in the position it should occupy when not actively engaged in working the gun.

When there is no parapet the detachment files on to the gun at the command, "*Take post at the gun*," Nos. 2 and 3 halting in line with the muzzle, Nos. 4 and 5 the trunnions, Nos. 6 and 7 the vent, No. 1 the trail, and the whole in echellon.

GENERAL DUTIES.

No. 1. Points, commands, superintends boring and fixing fuzes,

directs the gun into the line of fire in running up, makes ready and fires.

No. 2. Searches, sponges, rams home, runs up and elevates.

No. 3. Loads, uncaps, or removes the safety pin from the fuze when in the bore, assists to ram home the projectile, runs up, and elevates.

No. 4. Drifts the vent, serves it, pricks the cartridge, runs up, and traverses.

No. 5. Supplies 3 with wads if necessary, runs up and traverses.

No. 6. Supplies side arms to 2, cleans and damps the sponge, attends to the elevating screw and quoin in laying, has charge of sponge bucket, assists 2 in running up.

No. 7. Supplies 3 with cartridge, assists 3 in running up.

No. 8. Supplies 7 with cartridges from the cartridge store, and assists 9 when required.

No. 9. Brings up shell, which he hands to 3 when he has bored and fixed the fuze.

No. 10. Attends at the cartridge store, and serves out cartridge to 8.

To Prepare for Action.

Officer.	*No.* 1.
Prepare for action.	*Prepare for action.* *Elevate.* *Clear the vent.* *Search the gun.*

"*Prepare for action*"—

No. 1. Provides and fixes sights, a handspike, tubes in box, and lanyard.

No. 2. Handspike and sponge.

No. 3. Handspike and shell extractor; also removes the tampeon from the muzzle.

No. 4. Handspike, rammer, and pricker.

No. 5. Handspikes and wads.

No. 6. Sponge bucket filled, water brush, and support for head of side arms.

No. 7. Wad hook, and elevating screw.

No. 8. Two cartridge cases : goes to the cartridge store, gets one filled, and places it on the right of 7, and leaves the other at the cartridge store.

No. 9. Fuzes, and fuze and shell implements.

No. 10. Prepares to issue cartridges.

The sponge and rammer are laid on the ground clear of the platform to the right of the gun, and parallel to it, heads to the rear, and resting on the support supplied by No. 6, sponge nearest the gun ; the shell extractor and wad hook so as not to interfere with the working of any of the guns in the battery, and convenient to the guns for which intended. The sponge bucket near the sponge head ; the pricker in the loop on the right side of the carriage. No. 1 straps the tube box round his waist on the right side.

The handspikes are laid down two on each side of the platform close to the carriage, points to the front, bevelled side uppermost ; those of Nos. 2 and 3 outside and about two feet in advance of those of 4 and 5. No. 1's handspike in rear of the platform.

If the gun is to be prepared for drill only, Nos. 8 and 9 provide and hook a tackle to the eyebolt on the rear axletree and to a holdfast in the rear of the gun.

The gun is supposed to be at the rear of the platform.

The stores having been brought up, No. 1 gives the order "*Elevate*," "*Clear the vent*," "*Search the gun*," drifts the vent and fires a tube.

No. 2 supplies himself with the wad hook, searches the gun after the pricker is withdrawn, and replaces the wad hook.

Nos. 4 and 5 take a purchase with handspikes over the cheeks and under the breech ; the coin is withdrawn and the elevating screw put in by 6 and 7.

To Load.

Officer.	*No.* 1.
Range—yards.	
With—load.	*With—load.*

"*Load.*" No 1 gives 9 the nature of shell and length of fuze required, and during the loading fixes his centre hind sight or tangent scale at the required elevation.

No. 2 places himself in a convenient position for sponging. He places his left foot in line with, and about 12 inches from the muzzle, steps to the right with his right foot, and looks to his left rear, takes the sponge in a horizontal position from No. 6, left hand back down, right hand back up, brings it in line with the axis of the gun—enters the head into the bore,—slides his hands along the stave to his right as far as he can reach,—sends the sponge up the bore,—slides his hands out again, and forces the sponge hard home,—gives it two half turns, pressing it against the bottom of the bore,—withdraws the sponge hand over hand, turning it from him, cleaning the bore well. When the sponge arrives near the muzzle he jerks it out. His hands then should be in the position they were in when he introduced the sponge into the bore. He then hands the sponge to No. 6, and takes up the rammer, right hand about, the centre back down, left as near the head as possible, back up; as soon as the cartridge is put in he enters the head into the bore, and forces the charge home hand over hand. He then quits the stave and steps to the left rear clear of the muzzle, while No. 4 ascertains whether the cartridge is home. He then steps in, and as soon as the projectile is in the bore, rams it home, assisted by No. 3, in the same manner as he did the cartridge, he then springs the rammer, steps out, hands it to No. 6, and goes under cover.

No. 3 moves forward until in line with the muzzle, turns to his right, looks to his right rear, and as soon as the gun is sponged out receives a cartridge from 7, choke to the rear, turns right-

about and puts the cartridge into the bore; he then receives a shot from 5 or a shell from 9, and as soon as 2 has sprung the rammer, he introduces the projectile into the bore, point to the front, withdrawing the safety pin or uncapping the fuze as required; he then places himself in a corresponding position to 2 and assists him to ram home. When the projectile is home, he quits the stave and goes under cover.

No. 4 moves to the vent, turns to the front and presses his left thumb firmly on the vent. When No. 2 quits the stave he pricks the cartridge. Should he not feel the cartridge, he says "Not home," withdraws the pricker and serves the vent again, while No. 2 forces the cartridge home. He then returns the pricker and serves the vent while the projectile is being rammed home. As soon as No. 2 has sprung the rammer, 4 goes under cover.

No. 5, if shot are to be fired, takes one up, and a wad, if necessary and stands on 3's right front, handing it to him when the cartridge has been rammed home. He then goes under cover.

No. 6 doubles out, halts in line with the sponge head, turns to the left, picks up the stave with his right hand, back under, six inches from the head, turns three-quarters left-about, and in doing so lifts the sponge over his head, allowing the end of the stave to rest on the ground. His left hand meets the stave close to the sponge: his right is slipped up the stave about two feet. He then moves towards the muzzle, and passes the stave into the embrasure in such a manner that No. 2 can conveniently lay hold it, then turns right-about, takes up the rammer as before detailed for the sponge, enters the stave into the embrasure and rests the rammer head under the muzzle on the platform. He then waits at the left rear of No. 2, facing the gun, to receive the sponge; when he receives the sponge from 2 he allows the end of the stave to fall on the platform, steps to his left, turns three-quarters right-about, passing the sponge over his head, lays it down, and places himself in position to receive the rammer, which he does as soon as 2 has sprung it. He lays it down as he did the sponge, and goes under cover.

No. 7 brings up the cartridge in its case carefully covered, places himself opposite 3, cartridge case between his feet, left hand on cover loop.

After the sponge has been withdrawn he* lifts the cartridge out of its case by the choke with his right hand, his feet gripping the bottom of the case; places the cartridge in No. 3's hands, choke to the rear, takes the case back to the rear of the platform, and goes under cover.

No. 8 brings up a cartridge in a case, places it under cover as before detailed, and remains to receive from 7 the empty case, with which he returns to the cartridge store.

No. 9 brings up a shell, inserts a fuze under No. 1's direction, and gives the shell to 3 after 4 has pricked the cartridge.

No. 10 issues a cartridge to 8.

TO RUN UP.

Officer.	*No.* 1.
	Run up.
	Halt.

Directly the gun is loaded No. 1 gives "Run up," and applies his handspike under the rear axletree to guide the gun.

Nos. 2, 3, 4, 5 take up their handspikes at the centre, with the hands next the parapet, backs up, the other hands at the small ends, backs down; stepping up to their respective axletree arms, they apply their handspikes under and in rear of them, and stand ready to heave. Nos. 6 and 7, at the small ends of the handspikes, assist 2 and 3.

Taking the time from No. 2 and using short quick purchases, they heave together until the front trucks nearly touch the hurter, when No. 1 gives "Halt," slides his handspike to the rear, clear of the recoil, and looks over the sights, steadying himself by

* No. 7 is on no account to take off the cover of the cartridge case until the cartridge is wanted.

leaning on the cascable. Nos. 2, 3, 4, 5 withdraw their handspikes, drop the points to the ground, turn to the rear, step off the platform, holding their handspikes diagonally across the body, outward hands resting on the handspike at the full extent of the arm, bevelled side of the handspikes uppermost.

No. 6 kneeling on his left knee, in rear of the right cheek, takes hold of the large coin with both hands, or the small coin with his left hand, or works the screw, as may be directed by No. 1; but the screw should be used in general only for final adjustment.

TO LAY THE GUN.

Officer.	*No.* 1	
	Elevate.	*Handspikes.*
	Lower.	
	Quoin.	
	Elevate.	*Screw.*
	Depress.	
	Halt.	
	Trail (*right*).	
	,, (*left*).	
	Halt.	

No. 1, looking over the sights, gives the order "*Elevate,*" then "*Lower,*" and when the gun is at the required elevation, "*Quoin.*" If a slight amount of elevation or depression is required he gives the orders in a low tone of voice to No. 6.

"*Elevate,*" Nos. 2 and 3 step forward in line with the breech, place their handspikes, bevelled side down, over the steps and under the breech, and bear down; at "*Lower*" they allow the small ends to rise gently; and at "*Quoin*" they withdraw their handspikes and step outwards.

No. 6 withdraws the quoin as soon as 2 and 3 elevate, and at "*Quoin*" forces it sharply home. If the order "*Elevate*" or "*Depress*" is given in a low tone of voice, No. 6 works the screw until "*Halt*" is given; the other Nos. stand fast.

If the muzzle is to go to the left, No. 1 gives "*Trail Right,*" and when the muzzle is sufficiently to the left, "*Halt.*"

"*Trail right,*" No. 4 moves round on his right foot to the rear of his axletree arm, and applies his handspike under it to row; 5 stepping to his left, takes a purchase under the rear of the cheek and stands ready to heave over the trail. They heave together until the order "*Halt,*" and remain there steady till the next order is given.

"*Trail left*" is the converse of the above.

If much traversing is required, the order is "*Extreme right,*" or "*Extreme left.*" In this case No. 2 or 3, according to the side, takes a purchase in front of the rear truck, in addition to the other Nos.

TO MAKE READY AND FIRE.

Officer.	*No.* 1.
Fire one round.	*No.—Ready.* *No.—Fire.*

No. 1 lowers his tangent scale, gives "*ready,*" and presses the tube into the vent with his right thumb, steps back clear of the recoil, shifts the lanyard to his right hand and extends it, keeping his hand level with the vent, facing the gun.

As soon as "*Ready*" is given, the handspikes are laid down without noise, and Nos. 2, 3, 4, 5, and 6 go under cover.

At "*Fire*" No 1 draws the lanyard strongly towards his body, without a jerk, and replaces it under his belt, and goes under cover.*

As soon as the gun is fired No. 4 drifts the vent by inserting the pricker. No. 1 does not again give "*Load*" until the pricker is withdrawn.

* A "gas channel" is bored through the breech of the gun, through which the gas will escape if the tube should be cracked, thus showing that the gun is unserviceable.

To Run Back and Unload.

Officer.	*No.* 1.
	Run back.
	Halt.
	Unload.

When the vent has been drifted at "*Run Back*" the detachment double out and man the fall of the tackle, arranged by Nos. 8 and 9 for the purpose, and haul the gun back into the position for loading, No. 1 scotching up the right front truck and giving "*Halt*," "*Unload*," when the gun is sufficiently run back. On this order the gun is unloaded, Nos. 2 and 3 withdrawing the charge and 6 supplying and replacing the necessary side arms.

To Cease Firing and Replace Stores.

Officer.	*No.* 1.
Cease firing.	*Elevate.*
Replace stores.	*Lower.*
	Quoin.
	Replace stores.

"*Cease firing*," "*Replace stores*," No. 1 gives "*Elevate*," and the gun is depressed. He then gives "*Replace stores*," and the stores are replaced by the Nos. who brought them up.

After firing the bore should be washed out and the fittings oiled or greased, and when the bore is dry, the tampeon put in.

To Form Detachment Rear.

Officer.	*No.* 1.
Detachment rear.	*Outwards turn.*
	Double March.
	Halt.
	Front.

"*Detachment rear,*" No. 1 doubles to the left rear of the platform, faces the left, and gives the order "*Outwards turn*;" 2, 4, and 6 turn to the left, 3, 5, and 7 to the right.

"*Double march,*" Nos. 6 and 7, followed by the other Nos., wheel to the right and left, and when clear of the platform, to the right, and round No. 1's left shoulder, 8, 9, and 10 coming up into their places. When Nos. 2 and 3 have passed him, No. 1 gives "*Halt,*"—"*Front,*" and changes his flank by the rear.

TO CHANGE ROUNDS.

Officer.	*No.* 1.
Change rounds.	*Change rounds.*

In changing rounds No. 2 becomes 4, 4 6, 6 No. 1, No. 1 10, 10 9, 9 8, 8 7, 7 5, 5 3, 3 2.

TO CHANGE THE TRUCKS OF A STANDING CARRIAGE.—THE GUN IN ACTION.*

"*Change right rear truck.*"

"*Elevate.*"—No. 1 withdraws the small quoin; 6 applies it as a fulcrum on the platform and in rear of the right cheek; 4 and 5 take purchases under the cheek, bear down, and raise it off the ground; 6 takes off the truck, 7 removes the left truck (if necessary) in a similar manner. The front trucks are removed, one at a time, by 2 and 3 bearing down, taking purchases under the axletree, just inside the trucks, 6 and 7 removing the trucks as before.†

With the heavier guns 2's and 3's handspikes are double manned by 4 and 5.

* From Manual of Artillery Exercises, 1860.

† 8 brings up the new truck, and assists 6 or 7 to change the trucks. He takes the old truck to the rear. The rear trucks of a 64-pr. M.L.R. gun can be removed without the quoin. 4 and 5 applying their handspikes under the rear transom, double manned by 2 and 3.

R.M.L. ORDNANCE ON TRAVERSING PLATFORMS.*

The detachment is of the same strength, and the general duties are as for guns on standing carriages.

Some additional stores are required, viz.: 2 sets of luff tackle, 1 preventor rope, 2 truck levers, 2 iron-shod levers; 2 handspikes only are required.

To Prepare for Action.

"*Prepare for action,*" the different Nos. bring up the stores as detailed for standing carriages, with the exception of the handspikes of Nos. 1, 4, and 5.

No. 1 brings a preventor rope, which he attaches to the carriage (assisted by 3), he then takes 2 turns with it round the bollard, the running end coming off at the top towards the left.

Nos. 2 and 3 bring up a truck lever each.

Nos. 4 and 5, a shod lever and set of luff tackle each; they hook the single blocks to the rear eye bolts of the platform, the tackles are overhauled, double blocks carried to the rear, and the ends of the falls coiled down.

The handspikes are laid down, points to the front (bevelled side uppermost), next the gun, the truck levers in the same way outside the handspikes; the iron shod levers, bevelled side uppermost, scotches under the rear trucks of the platform.

To Load.

No. 2 mounts on the side-piece by the step, and places himself in the position for sponging; No 4 mounts on the side step, and serves the vent as at a standing carriage.

No. 3 mounts on the step to put in the cartridge, and on the platform to put in the projectile and wad.

To Run up.

"*Run up.*"—No. 1 with No. 7 holds on the preventor; Nos. 2, 3, 4, and 5 take up the truck levers; Nos. 4 and 5 raising the

* From Manual of Artillery Exercises, 1873.

small ends to enable Nos. 2 and 3 to hook the points to the eye-bolts. When this is done, Nos. 4 and 5 haul down the small ends by means of the lever ropes; Nos. 2 and 3 place the pawls and go under cover. Nos. 4 and 5 guide the levers whilst the carriage is in motion.

Nos. 1 and 7 ease off, hand over hand, and hold on when the mark on the preventer rope comes over the bollard. When the gun is in its proper position No. 1 gives .

"*Halt.*"—Nos. 4 and 5 heave down the small ends of the levers; Nos. 2 and 3 throw back the pawls; Nos. 4 and 5 allow the small ends of the levers to rise gently, manning the ropes when the levers are above their reach. When the rear of the carriage rests upon the platform the levers are unhooked, withdrawn, and laid down outside the handspikes by Nos. 2, 3, 4, and 5; 4 tightens the compressor, if the carriage is fitted with one; 2 and 3 pick up their handspikes and stand ready to elevate; 4 and 5 take a shod lever each, and place themselves opposite the trucks of the platform, points of levers on the racer ready for traversing.

To Lay the Gun.

The guns are elevated in the same manner as when they are mounted on standing carriages; when necessary, Nos. 4 and 5 double-man the handspikes of 2 and 3; on No. 1 giving the word "quoin" they take up their shod levers.

The guns are traversed by Nos. 4 and 5; but as these platforms are pivoted, or have the centres of the curves of their racers in front, in rear, or in the centre of the platform, the positions taken up by these Nos. to traverse differ according to the manner in in which the platforms are pivoted.

The position of Nos. 4 and 5 are as follows:—

Pivot A; that is under the muzzle of the gun when run up.

"*Trail right*"—

No. 5 applies his iron-shod lever under the left-rear truck of the platform, both hands back up, he pushes the platform over to the right, taking short quick purchases.

No. 4 stands facing to the rear with the point of his lever resting on the rear racer; at the word "*Halt*" he scotches the rear truck on his own side with the lever.

"*Trail left*"—

The numbers work in the opposite directions.

Pivot B; under the front part of the platform.

As with pivot A.

Pivot C; in the centre of the platform.

"*Trail right*"—

No. 5 works as with pivot A. No. 4 takes up his position at the front truck on his own side and works over the front of the platform to the left.

At the word "*Halt*" No. 4 withdraws his lever and runs with it to the rear truck and scotches it.

"*Trail left*"—

No. 5 works the front truck, and No. 4 the rear. No. 5 scotching the rear truck at the word "*Halt.*"

Pivot D; at an intermediate point between the centre of the platform and the rear block.

"*Trail right or left*"—

Nos. 4 and 5 work the front trucks, No. 4 working the front of the platform over to the left in the first case, No. 5 the front to the right in the second,

Pivot E; in front of the rear block.

As with pivot D.

Pivot F; in the rear of the rear block.

As with pivots D and E.

With platforms pivoted at A or B; at the word "*Extreme right (or left)*" Nos. 2, 3, 4, and 5 run to the rear of the platform and push it over in the direction ordered.

The platforms may also be traversed by tackle.

At the command "*Hook the traversing tackle*" Nos. 6 and 7 hook the double block to the eye-bolts of the platform, and Nos. 4 and 5 the single blocks to the rings or holdfasts prepared for them.

Nos. 2, 4, 6 and 3, 5, 7 haul on the tackle, or ease off at the command "*Trail right (or left)*" so as to move the platform in the direction required.

If the tackle, when hooked, hinders the service of the gun, the double blocks are removed by Nos. 6 and 7, or the single ones by Nos. 4 and 5 as may be deemed advisable and directed by No. 1.

To Make Ready and Fire.

"*Ready.*" Nos. 4 and 5 withdraw their levers, turn their bevelled sides up, and place them as scotches under the trucks, the levers resting on the racers; they then go under cover; 2 and 3 lay down their handspikes and go under cover.

No. 1 mounts on the step, makes ready, and fires.

To Run Back.

"*Run back.*"—No. 4 slackens the compressor, if the carriage is fitted with one.

The truck levers are applied as in running up.

No. 1, standing between the cheeks, holds the small ends of the truck-levers, and guides them; Nos. 6 and 7 overhaul the tackle, and hook the front blocks to the eye-bolts on the carriage.

All the numbers except No. 1 then man the falls, on their respective sides; and at the word "*Heave,*" haul the gun back.

When the gun is run far enough back, No. 1 hauls down the levers, the pawls fall; the levers are then allowed to come up, No. 1 rising with them. The front blocks are unhooked by 6 and 7, who carry them to the rear and lay them down clear of the racers, they then coil up the ends of the falls. No. 1 takes in the slack of his preventor rope; 2, 3, 4 and 5 unhook the truck levers, and lay them down.

R.M.L. GUNS BETWEEN THE 64-PR. AND 7-IN.

In working guns above the 64-pr. the drill is the same, except that Nos. 8 and 9 will bring up the projectile in the bearer and place it in the muzzle, when it will be pushed in by 3; and in

preparing for action 7-ft. handspikes are brought up in place of 6-ft.; 9 also providing a shell bearer.

7-INCH AND 9-INCH WROUGHT IRON R.M.L. GUNS.

7-INCH GUNS.

Weight—7 Tons; Length—11-ft. 9½-in.
System of rifling Woolwich system.
No. of grooves, 3; Twist.—1 in 35.
Weight of projectile.—115-lbs.
Weight of service charge.—14-lbs R.L.G. powder.
Weight of battering charge.— { 30-lbs. pebble powder, or / 22-lbs. R.L.G. powder.

9-INCH GUN.

Weight.—12 tons; Length.—12-ft. 3-in.
System of rifling—Woolwich system.
Weight of projectile.—250-lbs.
Weight of service charge.—30-lbs. R.L.G. powder.
Weight of battering charge.— { 50-lbs. pebble powder. / 43-lbs. R.L.G. powder.

Projectiles used with both guns.

Shot.— { Case / Palliser ; Shells.— { Common. / Shrapnel. / Palliser.

Double common shells are used with the 7″ gun.

7-INCH AND 9-INCH R.M.L. GUNS ON TRAVERSING PLATFORMS.*

The detachment consists of non-commissioned officer and eleven gunners.

TO TELL OFF.

Officer.	*No.* 1.
Tell off.	

They are told off and formed up "Detachment Rear," as detailed for R.M.L. guns mounted on common standing carriages.

* From Manual of Artillery Exercises, 1873.

TO TAKE POST UNDER COVER.

Officer.	*No.* 1.
Take post under cover.	*Right turn.* *Double march.*

The detachment takes post as detailed for R.M.L. guns on common standing carriages, Nos. 2, 4, and 6 on the right, 3, 5, and 7 on the left of the gun. 8 at the head of the powder lift, 9 and 11 at the head of the shell lift, 10 in the cartridge store, and 12 in the shell store.

GENERAL DUTIES.

No. 1. Points, commands, superintends boring and fixing fuzes, holds on to the preventor rope, makes ready, and fires.

No. 2. Searches, sponges, rams home, runs up and elevates.

No. 3. Assists to search and sponge, puts in cartridge (and wads when used), uncaps or removes safety pin from the fuze when in the bore, assists to ram home, runs up, and elevates.

No. 4. Drifts the vent, serves it, pricks the cartridge, attends to the compressor, and traverses.

No. 5. Supplies wads, assists to raise the 9-inch projectiles at the muzzle, and to ram them home, and traverses.

No. 6. Supplies side arms, assists to raise the 9-inch projectiles at the muzzle, and to ram them home; cleans the sponge with the brush and damps it.

No. 7. Supplies 3 with cartridge, holds on the preventor rope behind No. 1.

No. 8. Supplies 7 with cartridges.

No. 9. Bores and fixes fuzes, and, assisted by 11, brings up projectiles and places them in the bore.

No. 10. Issues cartridges from the cartridge store.

No. 11. Assists 9.

No. 12. Issues shells and fuze and tube cylinders* as required.

* Fuze and tube cylinders are not to be opened in any magazine.

TO PREPARE FOR ACTION.

Officer.	*No.* 1.
Prepare for action.	*Prepare for action.* *Elevate.* *Clear the vent.* *Search the gun.*

"*Prepare for action*" No 1 Provides and fixes sights, sees that the hydraulic buffer is supplied with the required amount of oil,* and is in proper working order, or adjusts Elswick compressor. supplies preventor rope, tubes in box, and lanyard.

No. 2. Sponge and iron-pointed lever.

No. 3. Shell extractor and iron-pointed lever. He removes the tampeon from the muzzle.

No. 4. Rammer and pricker.

No. 5. Wads and two iron-shod levers. When the 9-inch gun is fitted with traversing gear, he provides the handle and a fall for running back instead of two levers.

No. 6. Sponge bucket filled, support for heads of side arms, and brush for cleaning sponge.

No. 7. Wad hook.

No. 9. Fuzes, fuze borer, mallet, and plug key.

No. 10. Goes to the cartridge store and prepares to issue cartridges.

No. 11. Truck barrow when required, two shot-bearers and two brushes. He leaves one of each at the shot pile, the others at the shell lift.

No. 12. Goes to the shell store and prepares to issue shell, also supplies 9 with fuze and tube cylinders.

As, probably, there will be only one cartridge and one shell store for the service of two guns, the two Nos. 10 can assist one another in hoisting the cartridge cylinders, where there is a lift ;

* Twelve gallons.

or, where there is none, one will be in the store, the other at the point of issue. The two Nos. 12 can also assist one another in preparing and bringing shells to the foot of the lift or issue hatch.

The stores are laid down at the gun, as detailed for guns mounted on traversing platforms.

No. 5. reeves the running back tackle,* making fast the standing end to the stud of the carriage with an inside clinch; takes four turns round the bollard, running end coming off to the rear.

The stores having been brought up, No. 1 gives "*Elevate*," "*Clear the vent*," "*Search the gun*," drifts the vent, and fires a tube.

Nos. 2 and 3 search the gun after the pricker is withdrawn, 2 receiving the wad hook from 6, and returning it to him after the gun has been searched.

Nos. 4 and 5 elevate until No. 1 gives "*Halt*," which he does when the gun is in a convenient position for sponging and loading. When levers are used Nos. 4 and 5 will clamp at "*Halt*."

As soon as No. 6 has received the wad hook from 2 he lays it down, and the whole of the Nos. take post under cover.

To LOAD.

Officer.	*No.* 1.
Range—yards. *With—load.*	*With—load.*

"*Load*"—

No. 1 gives 9 the nature of shell and length of fuze required.

No. 2 moves into position for sponging, receives the sponge from 6, and, assisted by 3, sponges; he then returns the sponge to 6,

* Where the carriages are not fitted with a new running back gear, Nos. 9 and 11 bring up two sets of tackle, double and treble blocks; hook the double blocks to the rear eye-bolts of the platform, round in the tackle, and coil down the falls.

picks up the rammer, and, with 3, rams home the cartridge, standing clear of the muzzle while the cartridge is being pricked. He springs the rammer, assisted by No. 3, and retains it in his hand while the projectile is being put in. As soon as the projectile is in the bore he rams home, assisted by No. 3 (and at the 9-inch gun also by 5 and 6), springs the rammer as before, returns it to 6, and falls in under cover.

No. 3 moves into position, and, having assisted 2 to sponge, turns to his left-about, receives a cartridge from 7, choke to his left, and a wad, when one is used, from 5. He places them in the bore, and assists No. 2 to ram home and to spring the rammer. When the projectile is in the bore he pushes it well in, uncaps the fuze or removes the safety pin, and assists No. 2 to ram home and to spring the rammer as before.

No. 4 serves the vent, and, when the cartridge is home, pricks it.

No. 5 provides 3 with a wad, if one is to be used, and assists to put in the bore and ram home 9-inch projectiles.

No. 6 hands the sponge to 2, then, taking up the rammer, passes the stave through the embrasure and rests the head on the platform; he then stands ready to receive the sponge from 2, which he lays down and cleans. When the projectile has been rammed home he receives and lays down the rammer in the same manner; he assists to put in the bore and ram home 9-inch projectiles.

Nos. 7 and 8 perform their duties as detailed for R.M.L. ordnance on common standing carriages.

Nos. 9 and 11 bring up the projectile, point to the front—9 on the left, 11 on the right—and place it in the bore; 11 removes the empty bearer. With the 9-inch No. 5 assists 9, and 6 assists 11 in front on their respective sides to raise the projectile.

The projectiles are to be placed in the bearer so that the rear studs are in line with the end of it; the handles of the bearer being turned down whilst the projectile is placed in it.

To Run Up.

Officer.	*No.* 1.
	Run up.
	Halt.

"*Run up.*" Nos. 2 and 3 put the iron pointed levers into the sockets and bear down; should it be observed that the gun is running up too rapidly, 2 and 3 raise their levers and thus check it.

When compressors are used, Nos. 1 and 7 hold on the preventor rope, 7 behind No. 1. When the gun is in position No. 1 gives "*Halt.*" when 4 presses the lever, so that the compressor plates may grip;* if properly adjusted, they will do this when the left edge of the lever is in line with the upper part of the notch on the arc.

To Lay the Gun.

Officer.	*No.* 1.
	Elevate.
	Depress.
	Halt.
	Trail, Right.
	,, *Left.*
	Halt.

As soon as the gun is run up, No. 1 unhooks the preventor rope, and throws it clear of the compressor bars, and lays the gun.

Nos. 2 and 3 work the elevating gear, 4 and 5 traverse.

If the rear trucks are fitted to receive the iron pointed levers, Nos. 4 and 5 apply them; if not so fitted, tackles must be used and arranged as at page 14, last para.

* With platforms fitted with a tripper the compressor lever becomes self-acting.

To Make Ready and Fire.

Officer.	*No.* 1.
Fire one round.	*No.—Ready.* *No.—Fire.*

As with guns on standing carriages, but at "*Ready*" the gun Nos. stand clear on their respective sides, as circumstances admit, resuming their positions after the gun has been fired, No. 4 at once drifting the vent.

When the carriage is fitted with traversing gear, Nos. 4 and 5 will stand to the traversing handles, and as soon as the gun has been fired will, if necessary, at once traverse it back into the centre of the platform without any word of command.

To Run Back and Unload.

Officer.	*No.* 1.
	Run back. *Unload.*

(1.) With traversing gear. No. 1 disconnects the traversing gear, shifting and keying up the handle, and follows up the right front truck with a scotch. Nos. 2 and 3 apply their levers and bear down.

Nos. 4 and 5 heave round the traversing handles, 7 holding on the end of the fall.

(2.) With tackle. No. 1 follows up the right front truck with a scotch, and re-attaches his preventor rope when the gun is sufficiently hauled back.

Nos. 2 and 3 apply their levers and bear down.

Nos. 6 and 7 overhaul the tackles and hook the treble blocks to the front eye-bolts of the carriage.

The tackles are manned by all the available Nos. on their own sides; additional men will usually be necessary for the 9-inch.

When the gun is back Nos. 6 and 7 unhook the front blocks and lay them down.

The gun is unloaded by the same Nos. who loaded it.

To Cease Firing and Replace Stores.

Officer.	*No.* 1.
Cease firing.	*Depress.*
Replace stores.	*Halt.*
	Replace Stores.

The gun is depressed, and the stores are replaced by the Nos. who brought them up.

To Form Detachment Rear.

Officer.	*No.* 1.
Detachment rear.	*Outwards turn.*
	Double march.
	Halt.
	Front.

As with guns on common standing carriages.

To Change Rounds.

Officer.	*No.* 1.
Change Rounds.	*Change rounds.*

In changing rounds, No. 2 becomes 4; 4, 6; 6, No. 1; No. 1, 12; 12, 11; 11, 10; 10, 9; 9, 8; 8, 7; 7, 5; 5, 3; 3, 2.

S.B. ORDNANCE.*

The detachment for all S.B. guns for siege or garrison purposes consists of one non-commissioned officer and nine gunners, and the drill is the same as with the 64-pr. R.M.L. gun, mounted on any description of carriage, with the following exceptions :—

In preparing for action no shell extractor is required.

In loading, the projectile and cartridge are rammed home together. At the 8″, 10″, or 68-pr. guns, No. 3 assists 2 to sponge, then turns to his left-about and receives a cartridge from 7, turns to his right-about and places it in the bore. If shells are used, they are brought up in a shrapnel shell box (without a lid), fuze downwards, by Nos. 8 and 9, 8 on the right, 9 on the left, 8 carrying up the fresh cartridge case in his right hand. The box is passed under the muzzle by No. 9 to 6. With their inward hands, Nos. 3 and 6 lay hold of the rope handles, their outward hands supporting the box ; they raise it as high as the muzzle and capsize it smartly, throwing the shell into the bore. No. 8 takes the empty box to the rear with the empty cartridge case.

In firing 68-pr. solid shot the shot is placed on a bearer and passed under the muzzle by No. 5, and is lifted in by 3 and 6.

In unloading, where solid shot have been used, Nos. 4 and 5, at "*Unload*," take up their handspikes and apply them at once under the breech, to let the shot roll out of the bore, letting the breech down on the quoin as soon as 3 has received the shot, and lay their handspikes down.

* From Manual of Artillery Exercise, 1873.

40-PR. R.B.L. GUN.

Weight.—35 cwt.
Calibre.—4·75 inches.

System of rifling.—Polygrooved; 56 grooves, and 1 turn in 36·5 calibres.

Length.—10-ft. 1-in. (from face of muzzle to extreme end of breech, exclusive of screw.)

The Armstrong B.L. system of rifling consists in forcing a lead-coated projectile through a polygrooved bore, through which it can only pass by the lands cutting their way into the soft coat, the diameter of the bore being slightly less than that of the projectile. The twist is rapid.

The breech is closed by a steel "*vent-piece*," faced with a copper ring, which fits exactly into the "*breech-bush*" in the end of the powder chamber; the *vent-piece* is forced home and retained in its position by means of the "*breech-screw*," which is screwed home by the "*lever*," which works against the "*tappet-ring*" fitted on the octagonal part of the breech-screw.

The gun is sighted on both sides, to facilitate laying when firing through embrasures, and to render the provision of spare sights unnecessary. (An advantage gained by placing the sights at the side is that the muzzle of the piece cannot interfere with the line of sight in laying, and therefore the additional scale graduated to the long radius for (cast-iron) S.B. guns is dispensed with.)

The tangent scale is inclined (as already described for the 64-pr. M.L.R. guns) at an angle of 2° 16′ to the left.

The projectiles fired from this gun are:—

Case shot.
Solid shot (for practice only).
Common shell.
Shrapnell Shell.
Segment Shell.

Weight of charge—5-lbs. R.L.G. powder.

DRILL FOR 40-PR. GUNS ON TRAVELLING SIEGE CARRIAGES.*

The detachment consists of one non-commissioned officer and nine gunners, and falls in two deep to the left rear of the platform.

TO TELL OFF.

Officer.	*No.* 1.
—	—
Tell off.	

"*Tell off,*" No. 1 (who is on the left of the detachment) takes a pace to his front, turns to his right, and numbers himself 1; the right-hand man of the front rank numbers 2; the right-hand man of the rear rank 3; the second man from the right of the front rank 4; the man in his rear 5, and so on; after the detachment is told off No. 1 falls in again on the left of the front rank.

TO TAKE POST UNDER COVER.

Officer.	*No.* 1.
—	—
Take post under cover.	*Right turn.*
	Double march.

"*Take post under cover,*" No. 1 gives "*Right turn,*" "*Double march*" The detachment stepping off, wheels to its left at the left corner of the platform, the front rank filing to the left of the gun, the rear rank to the right; Nos. 2 and 3 halting close to the parapet, and near the mouth of the embrasure, 4, 5, 6, and 7 forming upon their left and right in succession, and the whole turning to the right-about together. No. 1 follows in rear of the detachment, keeping under cover as much as possible, 8 and 10 go to the cartridge store, 9 to the shell store.

TO TAKE POST AT THE GUN.

Officer.	No. 1.
—	—
Take post at the gun.	*Right turn.*
	Double march.

* From Manual of Artillery Exercise, 1873.

Where there is no parapet, the detachment files on to the gun at "*Take post at the gun,*" Nos. 2 and 3 halting in line with the breech, 4 and 5 the centre of the trail, 6 and 7 the trail eye, the whole in échelon outwards. No. 1 in rear of the gun, and 8, 9, and 10 with the limber.

GENERAL DUTIES.

No. 1. Points and commands, superintends boring and fixing fuzes, directs the gun into the line of fire when running up, makes ready, and fires.

No. 2. Attends to the breech-screw and vent-piece, primes, and runs up.

No. 3. Assists 2, and runs up.

No. 4. Sponges, if necessary, rams home, runs up, and traverses.

No. 5. Assists 4 to sponge and ram home, supplies shot, loads, runs up, and traverses.

No. 6. Supplies side arms to 4, cleans and damps the sponge, runs up, and attends to the elevating screw.

No. 7. Supplies 5 with cartridges, runs up.

No. 8. Supplies 7 with cartridges from the cartridge store or limber, and assists 9 when required.

No. 9. Brings up shell, and bores and fixes fuzes.

No. 10. Attends to the cartridge store or limber, and serves out cartridges to 8.

TO PREPARE FOR ACTION.

Officer.	*No.* 1.
Prepare for action.	*Prepare for action.* *Examine gun.* *Clear.*

No. 1. Provides and fixes sights, a handspike, tubes in box, and lanyard.

No. 2. Handspike, primers in pocket, oil-can, and waste.

No. 3. Handspike. He removes the tampeon from the muzzle.

No. 4. Handspike and sponge.

No. 5. Handspike and rammer.
No. 6. Sponge bucket filled, and support for heads of side arms.
No. 7. Elevating screw.
No. 8. Two cartridge cases; he places one filled on the left of 7, and leaves the other at the cartridge store or limber.
No. 9. Fuzes, also fuze and shell implements.
No. 10. Prepares to issue cartridges.

The sponge and rammer are laid down to the left of the gun, and parallel to it, heads to the front, sponge nearest the gun, the heads resting on the support supplied by No. 6, in line with the breech when the gun is run up, the sponge bucket near the sponge head, No. 1 straps the tube box round his waist on the right side.

The handspikes are laid down two on each side, outside the wheels, points to the front, bevelled sides uppermost, those of Nos. 2 and 3 outside and about two feet in advance of those of 4 and 5.

No. 1's handspike in rear.

If the gun is to be prepared for drill only, Nos. 8 and 9 provide and hook a tackle to the trail eye, and to a holdfast in rear of the gun.

The gun is supposed to be at the rear of the platform.

The stores having been brought up, No. 1 sees that the sights, elevating screw, and traversing arrangement are in good order, that the breech fittings are properly put on, and adjusts the indicator ring. This is done in the following manner:—The vent-piece is screwed home as it would be for firing. The lever and tappet ring are then removed. The indicator ring is passed over the octagonal part of the breech screw, so that the arrow marked on it or raised line will correspond with a similar mark on the gun. If the arrows cannot be made to coincide, the indicator ring is to be so placed that the arrow on it will be to the left of the mark on the gun, as close as the cogs of the indicator ring will permit. The tappet rings and lever are then replaced. They ought to be put on so that the lever ball will be resting on a cam

of the tappet ring on the right side of the gun, in a convenient position for No. 3 to give two taps after the breech is screwed up.

No. 1 then gives "*Examine gun,*" and, having satisfied himself that the bore is clear, gives "*Clear*;" should the bore not be clear when the vent-piece is removed, he gives "*Sponge out,*" when 4 and 5 place themselves in position for sponging, receive the sponge from 6, and pass it rapidly through the bore and withdraw it.

Nos. 2 and 3 move to the breech, No. 3 opens it by taking the lever handle in his right hand, back up, and swinging it round a half circle towards him, from cam to cam. This will strike a blow hard enough to move the screw, which is then unscrewed two turns and the vent-piece is released; 2 and 3 lift the vent-piece out of the slot and lay it on the flat surface on the top of the breech coil.

At "*Clear*" they drop in the vent-piece, 2 takes the lever handle in his left hand, back up, turning the handle towards him, screws up the breech screw until it is home; 3 then (for additional security) places both hands on the top of the lever ball and gives two smart taps; 2 and 3 then go under cover.

No. 1 hooks a tube to the lanyard, and as soon as the vent-piece is replaced, makes ready and fires without any word of command.

To Load.

Officer.	*No.* 1.
Range—yards.	*Run up.*
With—load.	*Halt.*
	With—load.

The gun is generally run up before loading.

"*Run up*"—

Nos. 2, 3, 4, and 5 take up their handspikes at the centre, with the hands next the parapet, backs up, the other hands at the small ends, backs down; 2 and 3 apply their handspikes horizontally

over the spokes of the wheels in front, under the brackets close to the breast, and bear down, 4 and 5 use their handspikes as levers of the second order under the rear part of the wheels; 6 and 7 double-man 2's and 3's handspikes, all the Nos. facing to the rear.

No. 1 applies his under the trail eye, and guides the gun into the line of fire.

As soon as the wheels nearly touch the hurter, No. 1 gives "*Halt*," slides his right hand, back up, to the centre of his handspike, and throws it to the rear.

Nos. 2, 3, 4, and 5 withdraw their handspikes, turn inwards, lay them down, and go under cover.

No. 1 then gives "*With shell, load*," and also to 9 the nature of shell and length of fuze required, adjusts his tangent scale to the required elevation and deflection, removing it with its socket from the gun for the purpose.

Nos 2 and 3 double out, unscrew the breech-screw, and lift the vent-piece on to the saddle. No. 3 goes under cover. No. 2 cleans the vent-piece, if required, drops in a primer, end with worsted downwards, and goes under cover. When the loading is completed, they double out again, drop the vent-piece into the slot, screw up the breech-screw, and go under cover.

Nos. 4 and 5 place themselves in position for sponging, receive the sponge from 6, introduce the sponge head into the bore, and sponge out in two motions; they withdraw the sponge, cleaning the chamber well; 4 then slips his right hand up the stave, quitting it with his left and letting the stave fall, cants it over his head to 6; picks up the rammer and assisted by 5 rams home, first the projectile, then the cartridge, springs the rammer, lowers the head, slewing his body to the right, and returns the rammer to 6. No. 5, after the gun is sponged out, receives a shell from 9, introduces it into the bore, having withdrawn the safety pin, and assists 4 to ram it home, quits the stave, receives a cartridge from 7, places it in the bore, and assists 4 to press it home. When

the loading is completed, Nos. 4 and 5 step outside the handspikes, turn inwards, pick up their handspikes as before detailed, move to the rear in line with the trail eye, and stand ready to traverse.

No. 6 doubles out, halts in line with the sponge head, turns to his right, picks up the sponge with his right hand at the head, back under, turns three-quarters left about, and in doing so, lifts the sponge over his head, allowing the end of the stave to rest on the ground His left hand meets the stave close to the sponge ; his right is slipped up the stave about two feet. He hands the sponge horizontally to No. 4, then turns to his right-about, picks up the rammer in the same way as the sponge, turns left-about, and lays the rammer on the trail (taking care that he is not struck with the stave of the sponge), head to the front, places himself at the right rear of 4, receives the sponge from him, cants it over his head in the same way as 4, and lays it down. In receiving the rammer, he takes it with his right hand a little below the centre, his left nearly at the small end, backs of both hands towards the rear, turns to his right-about and lays it down outside the sponge. He then goes to the elevating screw.

When sponging is not required, No. 6 does not lay the rammer on the trail, but hands it at once to 4.

No 7 brings up a cartridge in its case, and stands on the left rear of 5. While the projectile is being rammed home, with his left hand he takes off the cover of the case, and with his right takes out the cartridge and places it in No. 5's hands, choke to the right. He then takes the empty case to the rear of the platform, and goes under cover.

No. 8 as soon as 7's cartridge case is empty, doubles up with a fresh round, taking back the empty case.

No. 9 brings up a shell, inserts a fuze under No. 1's direction, and gives it to 5.

No. 10 issues a cartridge to 8.

TO LAY THE GUN.

Officer.	*No.* 1.
	Elevate.
	Depress.
	Halt.
	Trail (*right*).
	,, (*left*).
	Halt.

At "*Elevate*" or "*Depress*" No. 6 works the elevating screw as required.

At "*Trail right*" No. 4 heaves over the trail; at "*Trail left*" No. 5.

No. 1 may use the traversing bar for final adjustment.

When the guns are mounted on Clerk's platforms, at "*Extreme right* (*or left*)" Nos. 2 and 3 apply their handspikes and, with 4 and 5, heave over the side pieces, drawing out the iron bolts in the rear for the purpose; when it is necessary to shift the trail plank, 2, 3, 4, and 5 using the side pieces as fulcrums, place the points of their handspikes under the limbering-up handles, and thus raise the trail; 6 and 7 shift the plank.

TO MAKE READY AND FIRE.

Officer.	*No.* 1.
Fire one round.	*No.*—*Ready.*
	No.—*Fire.*

No. 1 lowers his tangent scale, gives "*Ready*," presses the tube into the vent with his right thumb, steps back clear of the recoil, shifts the lanyard to his right hand and extends it, keeping his hand level with the vent, facing the gun, and gives "*Fire.*"

As soon as "*Ready*" is given, the handspikes are laid down and Nos. 4, 5, and 6 go under cover.

"*Fire*" No. 1 draws the lanyard strongly, without a jerk, towards his body, replaces it under his belt and goes under cover.

In the event of a miss-fire, No. 1 will go round to the front of the axletree on his own side, and from there drop in another tube, keeping clear of the muzzle, resuming the position of "*Ready*"; if this again fails, and it is necessary to take out the vent-piece, time must be allowed to elapse before the breech-screw is unscrewed, and then the vent-piece removed quickly, the arm and body being kept clear of the breech.

To Run Back.

Officer.	*No.* 1.
	Run back.
	Halt.

"*Run back,*" which No. 1 gives (at drill) immediately after the gun has been fired, the detachment double out, man the fall of the tackle arranged by 8 and 9 for the purpose, and haul the gun back, No. 1 scotching up the right wheel, and giving "*Halt*" when the gun is sufficiently run back. The detachment then takes post under cover.

If tackle is not used; at "*Run back,*" Nos. 2 and 3 apply their handspikes in front of the wheels, using them as levers of the second order; 4 and 5 take a purchase with theirs over the most horizontal spokes in rear, and under the brackets; 6 and 7 double-man the handspikes of 4 and 5, the whole facing to the rear.

To Cease Firing and Replace Stores.

Officer.	*No.* 1.
Cease firing.	*Examine gun.*
Replace stores.	*Sponge out.*
	Clear.
	Depress.
	Halt.
	Replace stores.

"*Cease firing—replace stores,*" No. 1 gives "*Examine gun,*" which is carried out as previously detailed.

When the detachment is leaving off drill, or after firing is over, No. 1 orders 6 to depress the gun. He should also set his scales at zero, and move the traversing bar to the centre of the carriage.

"*Replace stores*" from No. 1, the stores are replaced by the Nos. who brought them up. After firing the bore should be washed out and the fittings oiled, and when the bore is dry, the tampeon put in.

NOTE.—The above drill has reference to the detachment under cover, but is applicable, with trifling modifications, to the case when there is none and the detachment has taken post *at* the gun.

TO FORM DETACHMENT REAR.

Officer.	*No.* 1.
Detachment rear.	*Outwards turn.* (*Right about*) *turn.* *Double March.* *Halt.* *Front.*

"*Detachment rear,*" No. 1 doubles to the left rear of the platform, faces the left, and gives the order "*Outwards* (*or Right-about*) *turn;*" 2, 4, and 6 turn to the right, 3, 5, and 7 to the left (or, the whole turn to the right-about). At "*Double march,*" Nos. 6 and 7, followed by the other Nos., move to the rear, and when clear of the platform, wheel to the right, and round No. 1's left shoulder, 8, 9, and 10 coming up into their places. When Nos. 2 and 3 have passed him, No. 1 gives "*Halt,*" "*Front,*" doubles along the rear rank, and places himself on the left of the front rank.

TO CHANGE ROUNDS.

Officer.	*No.* 1.
Change rounds.	*Change rounds.*

In changing rounds, No. 3 becomes 5, 5 7, 7 No. 1, No. 1 10, 10 9, 9 8, 8 6, 6 4, 4 2, 2 3.

To UNLIMBER.

Officer.	*No.* 1.
Unlimber.	*Prepare to unlimber.* *Lift.* *Limber drive on.* *Lower.*

"*Prepare to unlimber,*" No. 1 unkeys the keep chain, and with 2, 3, 4, 5, 6, and 7 stands to the trail, 2 and 3 nearest the gun; if there are no horses, 10 goes to the shafts, and 8 and 9 to the splinter bar.

"*Lift,*" the gun is unlimbered, at "*Limber drive on,*" the limber moves on, and at "*Lower,*" the trail is lowered to the ground.

To LIMBER UP.

Officer.	*No.* 1.
Limber up.	*Prepare to limber up.* *Lift.*

The several Nos. place themselves as for unlimbering, and at "*Lift,*" lift the trail on to the pin tail. No. 1 keys up, and the detachment forms the order of march.

POSITION OF DETACHMENT WHEN LIMBERED UP, IN ORDER OF MARCH.

No. 1, when at drill without horses, in line with the point of the near shaft, and two yards from it; when mounted, on the near side of leading horses.

Nos. 2 and 3 in line with the axletree of the gun carriage.

Nos. 4 and 5 in line with the centre of the trail.

Nos. 6 and 7 in line with the axletree of the limber.

Nos. 8 and 9 in line with the splinter bar.
No. 10 in line with the point of the off shaft.
The numbers stand covering one yard from the wheels.

IN FRONT.

Two deep two yards in front of the leading horses; or if at drill without horses, 15 yards in front.

IN REAR.

Two deep two yards in rear of the muzzle of the gun, No. 2 covering the off gun wheel.

RIGHT OR LEFT.

Two deep in line with the gun axletree, one yard to the right or left of the wheel.

TO SHIFT FROM TRAVELLING TO FIRING TRUNNION-HOLES.*

This must be done while the gun is limbered up.

Officer.	*No.* 1.
Shift from travelling to firing trunnion-holes.	*Prepare to shift the gun.* *Prepare to bear down.* *Bear down.* *Come up.* *Prepare to lift.* *Lift and heave.* *Prepare to bear down.* *Bear down.* *Come up.*

"*Prepare to shift the gun.*" Nos. 2, 3, 4, and 5 cast loose side-arms and handspikes, and unbuckle straps, should the gun be so secured; 1 removes tangent scales; 2 and 3 take off capsquares, 4 and 5 scotch the gun wheels with handspikes, 4 in front, 5 in rear.

* From Manual of Artillery Exercises, 1873.

"*Prepare to bear down.*" No. 2 places his handspike in the bore double-manned by 3 ; 4 passes a handspike across 2's to 5 ; 8 and 9 make fast two dragropes to the breech and pass the ends towards the muzzle, they then double-man 2's handspike.

"*Bear down.*" Nos. 2, 3, 4, 5, 8, and 9 bear down ; 6 hands the roller to No. 1, who places it under the breech as far to the front as possible, and gives "*Come up.*"

"*Prepare to lift.*" No. 4 crosses his handspike under that in the bore to 5 ; Nos. 1, 6, 7, and 10 man the ropes.

"*Lift and heave.*" The bends of the arms are placed under the handspikes ; the gun is raised out of the travelling holes, and hauled forward until the trunnions fall into the firing holes. The handspike men should keep their eyes fixed on the gun so as to be prepared for its descent. As soon as the gun is in the trunnion holes, the dragropes are cast off by Nos 8 and 9.

"*Prepare to bear down.*" No. 4 reverses his handspike and places it over that of 2.

"*Bear down.*" No. 6 withdraws the roller and straps it on the carriage ; 7 puts the elevating screw in. At "Come up," the gun is lowered on to the elevating screw, the handspikes withdrawn and laid down.

To Shift from Firing to Travelling Trunnion-holes.

The operation of shifting from firing to travelling is the reverse of the above. The roller should be placed under the breech, in front of the coil. No. 7 having removed the elevating screw.

40-pr. guns are to be kept in the firing trunnion-holes, with the elevating screw supporting the breech when travelling on ordinary roads. The travelling trunnion-holes are retained, that the gun may be shifted into them when travelling over very hilly roads.

To Change the Wheel of a Travelling Siege Carriage, Without a Lifting Jack, the Trail Serving as a Lever.*

Strength of detachment, the gun detachment.

* From Manual of Artillery Exercises, 1873

STORES REQUIRED.

The stores belonging to the gun, and in addition one large quoin.

Prepare to change the off wheel (or near).
Unlimber.
Lower.
Raise the trail.
Lower.

"*Prepare to change the off wheel.*"—Nos. 8, 9, and 10 bring up the fresh wheel, and place it on the ground near the off wheel. If the gun is limbered up, No. 1 unkeys the keep chain, and 2 the draught chain; 7 scotches the near wheel; 8 removes the linch-pin and washer; 2, 3, 4, and 5, place two handspikes close together on the ground, and then two more above them, immediately under, and in the direction of the off cheek, their points being flush with the front part of the axletree.

"*Unlimber.*"—The trail is raised. Nos. 6 and 1 place a quoin vertically on the handspikes, the thick end downwards, the thin end crossing the under side of the cheek, at right angles to it, and about four or five inches in rear of the axletree.

"*Lower.*"—The trail is borne down gently, till the cheek rests on the quoin, which is to be kept upright by No. 6. This will raise the wheel from the ground. Nos. 4 and 5 keep the trail steady, whilst 8, 9, and 10 remove the old and put on the new wheel.

"*Raise the trail.*"—The trail is again raised until the wheel rests on the ground; No. 6 removes the quoin, 2, 3, 4, and 5 the handspikes; and 9 replaces the washer and linch-pin.

"*Lower.*"—The trail is lowered, and the gun limbered up.

Instead of handspikes, a block of wood, or two quoins, placed lengthwise, one over the other, for the vertical quoin to rest on, will answer equally well.

The above is an easy and expeditious mode of taking off the wheel of a heavy gun to grease it.

TO CHANGE WHEELS WHEN A LEVER AND FULCRUM ARE USED.

The point of the lever is placed under the breast of the carriage; the fulcrum being placed in the most convenient position to admit of the lever being used.

7″ B.L. GUNS OF 72 AND 82 CWT.

System of rifling.—Armstrong B.L., polygrooved.
Length about 10-feet.
Projectiles.—Case shot, common, shrapnel and segment shells.
Weight of charge.—10 lbs. and 11 lbs. respectively.
Weight of shells, about 100 lbs.

7″ R.B.L. GUNS ON TRAVERSING PLATFORMS.

The detachment is the same as for the 40-pr., and is told off, and takes post under cover in the same way.

General Duties.

No. 1. Points, commands, superintends boring and fixing fuzes, holds on the preventor rope in running up, makes ready, and fires.

No. 2. Attends to the breech-screw and vent-piece, primes, runs up, and elevates.

No. 3. Assists 2, attends to tin cups, runs up, and elevates.

No. 4. Sponges, if necessary, rams home, runs up, and traverses.

No. 5. Assists 4 to sponge and ram home, loads, supplies shot, runs up, and traverses.

No. 6. Supplies side arms to 4, cleans and damps the sponge, assists to put in projectile, attends to the elevating screw.

No. 7. Supplies 5 with cartridges, holds on preventor rope in running up.

No. 8, Supplies 7 with cartridges from the cartridge store, assists 9 in preparing and bringing up shell.

No. 9. Brings up shell, bores and fixes fuzes.

No. 10. Attends to the cartridge store, and serves out cartridges, with lubricators attached, to 8.

Prepare for Action.

Officer.	*No.* 1.
Prepare for action.	*Prepare for action.* *Examine gun* *Clear.*

No. 1. Provides and fixes sights and preventor rope, tubes in box, and lanyard, also a file for nose of vent-piece.

No. 2. Truck lever, 7-foot handspike, primers in a pocket, oil-can and waste.

No. 3. Truck lever, 7-foot handspike, tin cups in a pocket, tin cup extractor and iron lever. He removes the tampeon from the muzzle.

No. 4. Sponge, iron shod lever, and set of gun tackle.

No. 5. Rammer, iron shod lever, and set of gun tackle.

No. 6. Sponge bucket filled, and support for heads of side-arms.

No. 7. Elevating screw.

No. 8. Two cartridge cases: he places one filled on the left of 7 and leaves the other at the cartridge store.

No. 9. Fuzes, fuze and shell implements, and two shell bearers.

No. 10. Prepares to issue cartridges.

The sponge and rammer are laid down as with the 40-pr., the tin cup extractor and iron lever on the carriage, and the truck levers, handspikes, iron shod levers, and tackle as with R.M.L. ordnance on traversing platforms.

Nos. 2 and 3 elevate, 6 holding up the stool bed with an iron shod lever, while 7 removes the pedestal, and puts in the elevating screw.

If the indicator and tappet rings and lever have been detached, they are brought up with the keep pins and fixed by Nos. 2 and 3.

The stores having been brought up, No. 1 gives "*Examine gun*," and proceeds as laid down for the 40-pr.

Nos. 2 and 3 mount up, unscrew the breech-screw, and lift the vent-piece on to the saddle. At "*Clear*" they drop in the vent-piece again, screw up the breech-screw, and go under cover.

No. 1. Hooks a tube to the lanyard, and as soon as the vent-piece is replaced, makes ready and fires without any word of command.

TO LOAD.

Officer.	*No.* 1.
Range—yards.	*Run up.*
With—load.	*Halt.*
	With—load.

"*Run up.*"—The same Nos. act as with a R.M.L. gun on a traversing platform. When the gun is run up, and the truck levers withdrawn, No. 1 gives "*With—load,*" gives 9 the nature of shell and length of fuze required, adjusts his tangent scale to the required elevation and deflection.

Nos. 2 and 3 mount up, unscrew the breech-screw, and lift the vent-piece on to the saddle, using the iron lever, if necessary; 2 cleans the vent-piece and primes it, and goes under cover; 3 removes the old tin cup with the extractor, and goes under cover; when the loading is completed, they mount up again, 3 passing a tin cup down the slot, edge to the front, pressing it into the bore; they then drop in the vent-piece, screw up the breech-screw, step down, pick up their handspikes, and stand ready to elevate.

Nos. 4 and 5 mount up, place themselves in position for sponging, receive the sponge from 6, introduce the sponge head into the bore, and sponge out in two motions. They withdraw the sponge, cleaning the chamber well, and lay down the sponge on the grating; No. 4 then picks up the rammer, reverses it by lowering the head, shifting the position of his hands, pushes the shell gently into the bore out of the bearer with the small end, lowers the head again, and introduces it into the bore, shifts his hands to the small end, and, assisted by 5, rams home first the shell then the cartridge, springs the rammer, lowers the head slewing his body to the right, and returns the rammer to 6. No. 5, after the gun is sponged, having removed the safety pin from the fuze, takes the handle of the bearer with his right hand, supporting the bottom with his left, and lifts it up assisted by 6, in line with the bore, returns the bearer, when empty, to 8, and assists 4 to ram home the shell; then, looking to his left rear, receives a

cartridge from 7, places it in the bore, lubricator to the front, and assists 4 to press it home. When the loading is completed Nos. 4 and 5 step down, pick up their iron shod levers, and stand ready to traverse.

No. 6 supplies the sponge to 4 and 5 as with the 40-pr., picks up the rammer, and lays it on the grating; he then places himself on the left of 4, and assists 5 to lift the shell, holding the handle of the bearer with his left hand. When No. 4 has pushed the shell in, 6 steps down, removes the sponge from the grating and lays it down, canting it over his head in the usual way, then receives the rammer, as with the 40-pr., from 4, and lays it down. He then goes to the elevating screw.

No. 7 supplies 5 with a cartridge.

No. 8 assists 9 to bring up the shell in its bearer, point to the front, holding the bearer by the right handle with his left hand and bringing up the second cartridge case full, in his right, places the shell on its base in its bearer, to the right of 5 on the right side piece of the platform, and waits to receive the empty bearer and cartridge case, with which he returns to the cartridge and shell stores.

No. 9 inserts a fuze under No. 1's direction, and, assisted by 8, brings up a shell, holding the left handle of the bearer with his right hand, places the shell on the right of 5.

No. 10. issues a cartridge, with lubricator attached, to 8.

TO LAY THE GUN.

Officer.	*No.* 1.
	Elevate (*handspikes*).
	Lower ,,
	Coin.
	Elevate (*screw*).
	Depress ,,
	Halt.
	Trail right.
	,, (*left*).
	Halt.

The operation is conducted in the same way as with R.M.L. guns on traversing platforms. In traversing, the respective duties of Nos. 4 and 5 are af course reversed.

TO MAKE READY AND FIRE.

Officer.	*No.* 1.
Fire one round.	*No.—Ready.* *No.—Fire.*

As with a R.M.L. gun on traversing platform.

TO RUN BACK.

Officer.	*No.* 1.
	Run back. *Halt.*

As with a R.M.L. gun on traversing platform.

TO CEASE FIRING AND REPLACE STORES.

Officer.	*No.* 1.
Cease firing. *Replace stores.*	*Examine gun.* *Clear.* *Elevate.* *Lower.* *Coin.* *Replace stores.*

As with the 40-pr., Nos. 2 and 3 elevating with handspikes, and 6 attending to the coin.

AMMUNITION.†

CARTRIDGES.*

"*Service cartridges.*" The bags of all service cartridges are made of white serge.

Lubricators are attached to the front of all cartridges for B.L. guns. Their object is to prevent fouling and leading by distributing a mixture of tallow and linseed oil through the bore.

The lubricator is choked inside the cartridge of the 40-pr.

The 7″ and 40-pr. cartridges have a paper cylinder placed in their centre in order to bring them up to the length of the powder chamber, the charge for which these guns were originally constructed having been reduced.

CHARGES.

The charges for rifled guns are about one-eighth of the weight of the projectile.

PROJECTILES FOR RIFLED GUNS.*

A rifled projectile is one that is fired in such a manner that it is compelled to rotate on a fixed axis. Its deviation being constant can therefore be easily corrected.

This rotation is obtained by means of spiral grooves cut in the bore of the gun.

The B.L.R. guns have a number of grooves (from 32 in the 6-pr. to 76 in the 7″) with a uniform spiral. The projectiles are lead-coated and somewhat larger in diameter than the bore across the lands. When the gun is fired the lead is forced into the grooves, and the rotation thus given to the projectile.

The M.L.R. guns have fewer, but broader and deeper grooves (from 3 in the 7-pr. to 9 in the 12″). The projectiles are fitted with studs of soft metal, which "take" the grooves, and thus impart the necessary rotation.

† Subjects under this head marked thus (*) are from Manual of Artillery Exercises, 1873.

Projectiles for R.M.L. guns are

- Shot... Case. / Palliser. / Solid.
- Shells Common. / Double Common. / Palliser. / Shrapnel.

Those for R.B.L. guns are

- Shot... Case. / Solid.
- Shells Common. / Shrapnel. / Segment.

Description and Use of Projectiles.

Shot.

"*Solid shot*" are only used for practice.

"*Case shot*" are cylindrical cases of sheet iron filled with 8 oz. balls (sand shot). Those for B.L. guns have studs at the base to prevent the shot being rammed too far up the bore.

Use.—Against troops in masses, especially cavalry; for flanking ditches, &c., at ranges up to about 600 or 700 yards. Beyond this the bullets would scatter too much and lose their effect. If the ground is soft much of the effect of case is lost.

Shells.

A "*common shell*" is a cast-iron shell, and is used filled with powder against magazines, buildings, earthworks, shipping, troops behind cover, materiel, &c. As large a bursting charge is used as the shell will hold, because being intended to act as a mine, as great an explosive effect is required as possible. The shell should not burst until it reaches the object aimed at.

The powder in a shell is ignited either at a given time, or on impact, by means of a fuze fixed in the head. See fuzes.

A "*shrapnel shell*" consists of a hollow cast-iron body, with a head of thin Bessemer steel, lined with elm. A chamber at the

base of the shell contains a small bursting charge, and above the chamber are piled bullets embedded in resin; a wrought-iron tube connects the head of the shell with the bursting charge, and a gun-metal primer screwed into the top of this tube assists to convey the flame from the fuze to the bursting charge. The latter is no more than sufficient to open the shell and release the bullets, which would scatter too much and lose their effect if a large bursting charge was used.

Use.—Against troops in the open beyond case shot ranges; they should burst from 20 to 80 yards short.

"*Segment shells*" are only made for B.L. guns; their use is the same as that of shrapnel shells, but they contain segments of iron built up round a cavity in the centre, which contains the bursting charge. They should burst among the troops aimed at, as the segments, owing to their shape, lose their velocity quickly and are more scattered than shrapnel bullets, owing to the bursting charge being in the centre.

The Royal Laboratory percussion fuze (which bursts on graze) is the best fuze to use with these shells. Segment may be used against troops behind a thin wall, the shell bursting just as it passes through the wall.

To distinguish these different natures of shells from one another.—

Shrapnel B.L. may be known by their projecting socket.

Common shells (64-pr.) have unloading holes, which shrapnel have not. Common shells, both M.L. and B.L. are longer than shrapnel to bring them up to weight.

B.L. segment are still shorter than shrapnel, but are otherwise difficult to distinguish from B.L. common shells—the head of the latter is rather more gradually curved.

"*Palliser*" projectiles (shot and shell) are made of very hard iron, and the heads (which are pointed) are chilled to harden them still more. The shot are more solid about the head than the shells, but they also have a hollow in the centre, and can be used with a bursting charge, as shell, if required. Both shot and

shell have the base closed with a plug which is screwed in, and can be removed for the insertion of the burster. They have no fuze hole, as the bursting charge is exploded by the shock on striking. The shells are rather longer than the shot, and the heads are painted white to distinguish them. They are much more solid in construction than common shells. Palliser projectiles are fired with battering charges from R.M.L. guns of 7″ calibre and upwards.

Use:—To penetrate iron plates on ships and forts. The shot are said to penetrate better than the shell in oblique firing.

FUZES.

Time Fuzes.*

A time fuze is one that can be made to burst a shell at any given period of its flight.

Time fuzes consist of a case of wood, into which is pressed fuze composition (except the 5 seconds, which is pressed with mealed powder, and burns at double the speed of fuze composition, or an inch in 2½ seconds).

All time fuzes (with the exception of the 20 seconds and mortar fuzes) have, in addition to the composition channel, powder channels at the sides within the case, to ensure the flame passing at once to the charge in the shell.

Fuze composition burns at the rate of one inch in five seconds at rest.

The fuzes used with M.L. ordnance are ignited by the flame, on the discharge of the piece, setting light to the quick match priming round the head.

Those for B.L. ordnance have a detonating arrangement in the head, which is set in action by the shock of discharge.

For R.M.L. Ordnance.*

"5 *seconds*."—

They can be used with all M.L.R. shells.

They contain two inches of *mealed powder*, and burn five seconds.

They are marked on two sides, representing half and quarter seconds, so that they may be adapted to greater nicety of range.

They are intended for use with shrapnel shells; the accuracy of the burst of such shell in flight being of great importance, and the same accuracy or ranges not being obtainable with the 9 seconds fuzes.

They are painted *red* and drab colour.

"9 *seconds.*"—

They can be used with all M.L.R. shells.

They contain two inches of fuze composition, which burns 10 seconds when at rest.

They are marked on two sides, in even and odd numbers, representing half seconds.

They are painted *black* and drab colour.

"20 *seconds.*"—

They are used for common shells only, *not* for shrapnel.

They have four inches of fuze composition, which burns 20 seconds.

They have no powder channels at the side, and only the last two inches of composition are marked in a spiral direction round the fuze. The numbers representing half seconds, thus 20, 22, 24, and so on. These fuzes are not used with 40-pr. B.L.

They are painted *drab* colour.

For R.B.L. Ordnance.*

The fuzes for B.L.O. are identical with those for M.L.O., except that, as there is no windage, a detonator is placed in the head, which is set in action by the discharge of the gun, and ignites the fuze composition.

The latest pattern has a safety pin to support the head of the detonator; this should not be withdrawn until just before the shell is placed in the bore.

These fuzes can be used for all shells having fuze holes of general service gauge.

Preparing and Fixing Time Fuzes.*

A fuze is prepared by boring through one of the side holes into the composition channel.

For this purpose a hook borer is used for garrison service, it is so constructed that if the fuze is put in one way the bit is at right angles to the composition, if the reverse way the fuze composition will be at an angle to the borer.

In boring, the fuze should be held in the left hand, head towards the body, the back of the hook of the borer downwards, the point of the bit being opposite to the mark, corresponding to the required number, so that the bit may be screwed home at right angles to the composition.

Breech-loading fuzes must be carefully screwed into the shells by hand. The safety pin should not be removed until just before the shell is placed in the bore.

All other fuzes should be firmly fixed either by smart taps with a mallet or a blow against a hard substance.

In fixing a fuze care must be taken that the tape is not jammed so that there will be difficulty in uncapping.

To Distinguish the Different Time Fuses from One Another.

B.L. time fuzes are longer above the top hole than M.L. fuzes, to allow for the detonating arrangement in the head : they may also be known by the safety pin, and by their having no priming of quick match round the head. They are also labelled at the top "not to be struck." The 20″ time fuzes M.L. and B.L. are of course longer than the others, and the holes are bored and marked spirally round the fuze.

The 5″ fuzes though of the same length as the 9″ are painted red to distinguish them.

Percussion Fuzes.

A percussion fuze is one that depends wholly upon impact for its action.

Those used with 64-pr. M.L.R. and 40-pr. B.L.R. shells are,—
(1) Pettman's general service (G.S.).
(2) Royal Laboratory.

Pettman's G.S. is also used with all common and segment shells for rifled guns of garrison calibres.

It is made of gun metal, and is screwed into the head of the shell; It requires no preparation.

The interior is so arranged that on the shock of discharge, a detonating ball in the body of the fuze is released, and on impact of the shell with the object, this ball is thrown violently against the sides of the body, and the detonating composition exploded; the flame passes through the fire holes in the plugs at the base of the fuze and fires the shell. A further arrangement is made to ensure the fuze acting if the detonating ball should not be released on discharge, (which is sometimes the case with B.L. guns.) A plug called the "Steady plug," near the head of the fuze is cupped out to receive detonating composition. A small gun-metal ball rests just above the steady plug till the shock of discharge, when the steady plug flies back and the ball is released. On impact, the steady plug is thrown forward against the plain ball, and the detonating composition being ignited, the flame passes through the body of the fuze and fire holes to the bursting charge. This fuze does not burst on graze on water.

Royal Laboratory Fuze.

The body is of gun metal, and is screwed into the head of the shell. It requires no preparation, but the safety pin through the head must be withdrawn immediately before the shell is placed in the bore with B.L. guns, or before being rammed home with M.L. guns. The interior arrangements are as follows:—A steel point projects downwards from the top; a pellet driven with composition like a tube, and having a percussion cap fixed in the head, is kept in its place by a guard until shock of discharge, when the guard shears the flanges of the pellet and falls back to the base of the fuze, enabling the pellet on shock of graze, or on

impact, to fly forward and explode the cap against the steel point in the head of the fuze.

This fuze will act on graze even on boggy ground or on water. The fuzes may be fixed before going into action.

To Fill Common Shells.*

Before being filled they should be carefully scraped inside with a copper scraper, to loosen any iron filings, &c., which might be adhering to the lacquer.

The bursting charge is poured in gradually through a funnel, and the shell tapped with a mallet and moved from side to side to shake the powder down. No grains of powder must be left in the screw-thread of the fuze hole bush.

To Fill Shrapnel Shells.*

The bursting charge is poured in and shaken down. The primer is then dropped into its place and screwed home. Primers for Shrapnel shells are small brass cylinders, loosely filled with L.G. powder, the top is pierced with three holes, and the bottom lightly closed.

Primers for Vent Pieces of B.L.R. Guns*

Are used with the 7″ and 40-pr. B.L.R. guns, and consist of a cylinder of leather paper, driven like a tube, with three strips of red worsted attached to the exterior.

To prime, the primer is pressed into the vent, worsted end first, (use: to convey the flash from the tube to the cartridge).

Tin Cups*

Are used to prevent, as far as possible, the escape of gas on discharge in B.L.R. guns.

In the breech screw guns, they are placed against the cartridge, with the edge to the front. A small extractor hook is provided, by which to withdraw them after firing.

Copper Friction Tubes

Are driven with mealed powder pierced with a central hole ; a small "nib-piece" is inserted near the top, containing a small friction bar with detonating composition above and below it, on pulling the lanyard, the friction bar is pulled out, igniting the detonating composition and firing the tube. The hole through the tube allows the flash to pass instantaneously through it to the cartridge.

LAYING ORDNANCE, &c.

DEFINITIONS.*

Axis of the Gun.

The axis of a gun is an imaginary line passing down the centre of the bore.

Axis of the Trunnions

Is an imaginary line passing through the centre of the trunnions at right angles to the axis of the gun.

Line of Fire

Is the prolongation of the axis of the gun.

Line of Sight

Is the line passing through the notch of the tangent scale and tip of the trunnion sight to the object.

Trajectory

Is the line made by the shot in passing through the air.

Range

Is the distance from the muzzle to the second intersection of the line of sight and the trajectory.

Angle of Elevation or Depression.

Is the angle formed by the line of fire and line of sight.

Deflection

Is the distance of the trajectory to the right or left of the line of fire measured perpendicularly.

Velocity

Is the rate at which a shot moves. Initial velocity is that with which it leaves the bore of a gun. The force with which a shot strikes depends on its weight and velocity.

* From Manual of Artillery Exercises, 1873.

Preponderance

Is the excess of weight in the rear of the trunnions over that in front.

Windage

Is the difference between the diameter of the bore and that of the projectile.

To Lay a Gun.*

To lay a gun is to direct it in such a manner that the top of the notch of the hind sight, the apex of the fore sight (whether muzzle or trunnion), and the objects are in line.

The scales having been adjusted as explained, No. 1 proceeds to lay the gun, he places himself in rear of gun, bringing his eye to a level with the top of the hind sight, and about six inches in rear of it; and when laying guns where it is necessary to stoop, places his feet so that the body is well balanced, steadying himself by leaning on the gun with his arm; and gives the necessary orders for elevating or traversing, until the gun is laid as above; with field guns he himself elevates or depresses.

With guns fitted with a traversing bar the final adjustment is given by No. 1 himself.

In laying a gun, avoid putting the back of the nail on the top of the sight, the hand to cover the eye, holding the tangent scale, or other peculiarity.

Much will depend on the Nos. who move the gun under direction of No. 1. With practice and intelligence they will readily understand when the gun is to be moved fast or slow, much or little. The word of command will be a guide to them. When loud they will work fast, when low they will understand that the gun is nearly on the object and must be moved gently.

* From Manual of Artillery Exercises, 1873.

General Rules to be Observed.*

Get a clear view of the object, and see that the gun is approximately in the line of fire before looking over the sights.

Give a word of command to move the gun at the same instant that you look over the sights.

Always lay as quickly as possible, as the eye will not then become wearied.

Fixed Objects.*

In firing at a target, invariably lay on the bull's-eye.

Lay on the point to be struck with guns fitted with deflection scales; as all allowances for wind, difference of level in trunnions, should be made on the scales, not by laying high or low, right or left.

When one wheel stands lower than the other, the gun will throw the shot towards the lowest side.

The wind has considerable effect in causing the shot to deflect to the right or left, especially at long ranges.

If one trunnion is lower than the other, the projectile will be thrown to the side of the lowest trunnion.

Moving Objects.*

If the object is moving parallel to the front of the battery, first calculate the distance that the gun must be laid in front of the object, taking into consideration the range and rate of motion, and traverse in front of it just sufficiently to allow the gun to be fired deliberately when the object comes to the distance for which allowance has been made; the elevation being given with reference to the line on which the object is moving. If it is necessary to move the trail a second time, the elevation must be corrected.

In laying guns having a deflection scale, the allowance can be made on the scale, and the gun must then be fired as the object crosses the line of sight.

* From Manual of Artillery Exercises, 1873.

When firing at a moving object, No. 1, as soon as he has got the elevation, must place himself in prolongation of the axis of the piece, stepping clear of the recoil as he gives the order "Fire." When firing from guns on dwarf or casemate platforms, he stands on the rear part of the platform.

It must be remembered that in firing at moving objects the ranges are constantly varying, and consequently the length of fuze.

RULES FOR CORRECTING ELEVATION AND DEFLECTION WITH RIFLED GUNS.

Elevation.

If the projectile goes over or under, substract or add
1 minute for every 10 yards up to 500.
1 ,, ,, 7 ,, ,, 1000.
1 ,, ,, 6 ,, ,, 3000.

Deflection.

Deflection is always given on that side to which the shot is to be thrown.

Each minute of deflection on the sight gives a difference of an inch in every 100 yards of range. Therefore to correct deflection divide the number of inches in the deflection by the number of 100 yards range, and the result will be the number of minutes to be given.

To Find the Length of Fuse

Divide the number of hundreds of yards in the range by 2, and add 1 up to 1000 yards, 2 up to 2000, 3 up to 3000 for the length of fuze in tenths of inches.

Ex.—To find length of fuze at 1800 yards for 40-pr. B.L. gun—$\frac{18}{2} + 2 = 11$.

MOUNTING AND DISMOUNTING ORDNANCE.

GYNS.*

TRIANGLE GYNS.

These are either of wood or iron, and are designated as—

1. *The light* 16-*ft. gyn.*
2. *The light* 18-*ft. gyn.*
3. *The heavy* 18-*ft. gyn.*

The first weighs about 9 cwt., and will raise 70 cwt. when fitted with wrought iron, and 60 cwt. with cast iron. The second (wood) weighs 13 cwt., and when fitted with wrought iron is adapted for weights up to 7 tons. The third (wood) weighs about 26 cwt., and will lift 12 tons.

In working with the gyn the prypole is the front, and the following points should be attended to—

When it is finally in position over a weight, the prypole should be equidistant from the feet of both cheeks, and the head directly over the centre of gravity.

The more upright the gyn, the greater strain it will bear.

It should be directly over the place where the weight when lowered is to rest, so as to avoid the difficulties arising from hauling the weight towards the cheeks.

A weight should be raised or lowered, whenever practicable, towards the cheeks, as for instance, in mounting or dismounting a gun from a traversing platform ; if a weight suspended is hauled to the right or left, as is sometimes done to get the trunnions of a gun over the trunnion holes of a carriage, the gyn is very likely to be upset.

If a weight to be lifted is not under the head of the gyn, an undue strain will be brought on the cheek nearest the weight, which will give the other a tendency to lift, and so upset the gyn. With care a weight may be moved a few inches at a time to the

* From Manual of Artillery Exercises, 1873.

right or left by means of a gyn, or, if on rollers, it may be moved in the same way.

After any operation with a gyn has been completed "*Take post*" is given.

16-FT. AND 18-FT. LIGHT GYN.

The detachment consists of one Non-commissioned Officer and 12 gunners told off as for M.L. gun drill.

To Arrange Stores.

"*Arrange Stores.*"—

The stores are brought up as nearly as possible by the Nos. who are to use them, *i.e.* :—

No. 1. A hammer and a piece of spunyarn.
Nos. 2 and 3. Each a gyn-lever, and handspike.
Nos. 4 and 5. Each a handspike.
Nos. 6 and 7. Three gyn trucks, one spade and one pick-axe, if required.
Nos. 8 and 9. Each a dragrope.
Nos. 10 and 11. A set of tackle consisting, for the 18-ft. light gyn, of two treble 12-in. Bothway's blocks and 4-in. fall, 18 fathoms long, or,
for the 16-ft. gyn, of one double and one treble 10-in. Bothway's block, and 3½-in. fall, 15 fathoms long.
Nos. 12 and 13. Gun sling 6″ or 7″ rope (according to the gyn), 10 or 11 feet long, and gun fid.

The stores are laid down near the places where they will be required, viz :—levers and handspikes to the right and left of the feet of the cheeks of the gyn, points to the front, the trucks where the feet are to stand, the tackle on the right, upper block in line with head of gyn, lower one in line with upper cross-bar, fall on the right, neatly coiled and free to run; the sling and dragropes near the weight to be lifted.

General Duties.

No. 1. Commands.
Even Nos. right side. Odd Nos. left side.
Nos. 2 and 3. Charge of levers.
Nos. 4 and 5. Assist 2 and 3.
No. 6. Passes fall round windlass, holds on to it, makes it fast, eases off and lowers gun.
No. 7. Assists 6 and holds on next him.
No. 8. Holds on behind 6.
No. 8. Behind 7 and coils down the fall.
Nos. 10 and 11. Reeve and unreeve blocks, 10 the lower, 11 the upper, they sling the gun, and steady it on their own sides.
Nos. 12 and 13. Assist to work levers.

Take Post on the Gyn.

"*Take post on the gyn.*"—"*Right turn.*"—"*Double march.*"
The detachment turns to the right, wheels to the left, opening out, and halts; front rank covering left cheek, rear rank the right; Nos. 2 and 3 halting one pace from the cheeks, the other Nos. one pace from each other.

Put the gyn together.—Place the windlass.
Prepare to raise the gyn.
Hook the tackle.
Raise the gyn.—Halt.
Prepare to place the gyn.
Cheeks in, out, right or left.
Lift.—Halt.
Prepare to carry the gyn to the right or left.
Lift.—Halt.

"*Put the gyn together.*" No. 2 unkeys the upper cross-bar, and passes it to 3; 3 unkeys the lower cross-bar and passes it to 2; 6 and 12, 7 and 13 assist to pass cross-bars to 2 and 3, after which they place the windlass between the cheeks. No. 9 unkeys the

prypole bolt, which 8 draws out; 4 and 5 at the cheeks and 8 and 9 at the prypole, then bring the top of the gyn together, prypole between the cheeks. No. 4 holds up top of right cheek, 9 top of prypole, 5 the shackle, and 8 passes the bolt through them. No. 5 then raises the top of the left cheek; 8 passes the bolt through it, and 9 replaces the key.

"*Place the windlass.*" Nos. 6, 7, 12, and 13 hold up the windlass; 6 puts the right gudgeon into the gudgeon hole of the right cheek; 7 and 13 bring left cheek towards right, until left gudgeon is also placed in its gudgeon hole; 2 and 3 assist by applying handspikes under the spikes of the gyn cheeks on their respective sides; when the operation is completed they close the cheeks upon the windlass and bolt the bars.

To Raise the Gyn.

"*Prepare to raise the gyn.*" Nos. 2 and 3 facing inwards, each place a handspike slantwise under the lower crossbar, close to the cheeks, and take a purchase to prevent them slipping; 4, 5, 6, 7, 12, and 10 stand to the cheeks near the head of the gyn; 8 passes a handspike through the pryhole ring to 9, and both Nos. stand with their backs towards the top of the gyn; having their hands next the prypole, back under, their others back over.

"*Hook the tackle.*" Nos. 8 and 9 lift at the handspike, and bring the foot of the prypole towards the cheeks, whilst 4, 5, 6, 7, 12, and 13 raise the top of the gyn. No. 11 hooks the upper block to the shackle, assisted by 10, with the point of the hook towards the prypole; the running end of the fall leading from the upper block. No. 10 brings the lower block under the gyn, and hooks it to the upper crossbar, assisted by 11, the back of the hook downwards; they then haul in the slack, and place a half-hitch on the point of the hook with the fall, the bight of the latter being brought up below the crossbar; they then place themselves on the outside of 8 and 9, grasping the handspike ready to lift.

"*Raise the gyn.*" The prypole Nos. walk back towards the cheeks, which the remaining Nos., except 2 and 3, raise as high as they can, facing the windlass.

When the head is once rising, the Nos. should walk in quickly with the prypole.

"*Halt.*" The prypole is allowed to rest on the ground at once No. 1 should place himself in rear of the centre of the gyn so as to see that the prypole is brought back opposite to the centre of the windlass.

To Place the Gyn.

"*Prepare to place the gyn.*" No. 1 places himself in rear of the centre of the windlass, so as to see that in moving, the prypole is kept within safe limits right or left of the centre of the windlass. Nos. 2 and 3 each pass a lever under the windlass from the outside close to the cheeks to 4 and 5, who man them on the inside. Nos. 6 and 7 each pass a handspike under the windlass from the outside to 12 and 13 inside, the whole facing outwards :— that is, 2, 4, 6, and 12 to the right, and 3, 5, 7, and 13 to the left. Nos. 10 and 11 place the coil of the fall on the hook of the lower block.

"*Cheeks in, out, to the right, or to the left.*" "*Lift,*" The Nos. thus posted act according to the directions of No. 1.

When lifting to the right or left, the Nos. at the cheeks should face in the direction to which the gyn is to be carried.

Prypole in, out, to the right, or to the left." "*Lift.*" The position of the prypole is similarly altered by means of the handspike through the prypole ring, manned by Nos. 8, 9, 10, and 11.

"*Halt.*" The cheeks or prypole are allowed to come to the ground *at once.*

Position of Gyns.

In Mounting or Dismounting Guns on Traversing Platforms.

If the gun is mounted on a platform, for racers due to "A" or "B" pivot, run the carriage back to the stops, which will permit the gyn to be placed so that the rear block of the platform, when

traversed, will pass outside the prypole. The space between the outside of the platform and the inside of the prypole should not be less than the width of the platform.

With platforms on racers, having a "C" pivot, the gyn is placed over the gun, which must be run back to the stops, and the gyn placed so that after the gun has been raised, the carriage can be run up and the platform traversed, so as to admit of the gun being lowered parallel to the platform.

With platforms on racers, having "D" or "F" pivots, the gun is run up until the muzzle (or fid, if one is used), being close to the inside of the parapet, can clear it in lowering, the gyn is then placed obliqely over the gun, the cheek furthest from the pivot close to the platform, so as to allow the greatest amount of traversing.

To Carry a Gyn when Raised.

"*Prepare to carry the gyn to the Right* (*Left, &c.*)." The prypole Nos. turn to the windlass, those at the windlass in the direction the gyn is to be carried.

"*Lift.*" The whole gyn is raised and carried to the right, left, front, or rear, by the Nos., placed as above, No. 1 giving the word "*Halt*" when the gyn is in position.

In carrying to the *front* or *rear*, a dragrope should be made fast close under the ring of the prypole and two turns taken round the windlass, the end being held on to or made fast.

The less splay given the easier will it be to carry a gyn.

To Place the Trucks of a Gyn.

The trucks are placed under the cheeks and prypole by No. 1, their inward edges being sunk, until the legs of the gyn are perpendicular to them.

When there is danger of the feet slipping, the prypole must be secured to the cheeks by lashing ropes as near the ground as possible; this is done by Nos. 10 and 11.

To Raise a Gun by a Gyn.*

Pass the fall round the windlass and sling the gun.
Heave in the slack.
Shift the fall.
Work levers.
Stopper and shift the fall.
Unstopper.
High enough—make fast.
Out levers.

"*Pass the fall round the windlass and sling the gun.*" Nos. 2, 3, 4, and 5 place themselves on the outside of the windlass, opposite to the iron sockets on their respective sides; 2 and 3, after the slack is hauled in, raise the sockets so that the levers can easily enter, 4 and 5, behind 2 and 3, holding the levers in their outward hands. No. 6 on the inside of the windlass lifts the coil of the fall over the windlass; 7 receives it, and passes it back to him under the windlass. It is thus passed over and under until four turns are taken round the barrel; the turns are taken towards the right, when the fall of the tackle comes out on the left of the upper block, and towards the left, when the fall comes out on the right. When the four turns have been taken, No. 7 throws the running end of the fall to 8 and 9, who stretch it out, and 6 lays hold of it a little in advance of 7. The whole nearly fronting the gyn. Nos. 10 and 11 cast off the coil of the fall and let the tackle hang, then fix the sling or lashing, they also fix dragropes on the breech and muzzle.

"*Heave in the slack,*" Nos. 6, 7, 8, and 9 heave in as much as possible, then hold on; after which 2 and 3 work the sockets.

"*Shift the fall,*" No. 6 eases the turns of the fall, and shifts them, as directed, to the end of the barrel of the windlass, 7 holding on above the windlass.

* In this case a gun has been taken as an example, but any other weight would be treated in the same way.

"*Work levers,*" Nos. 2 and 3 receive the levers from 4 and 5 and insert them in the sockets, then assisted by 4, 5, 12, and 13 haul down until the small ends touch the ground; the levers are then, without any pause, thrown up as before, hauled down, and so on.

When the fall has worked to the end of the barrel, it must be *stoppered and shifted.*

"*Stopper and shift the fall,*" No. 2 and 3 withdraw their levers. If no stopper is available, No. 6 walks forward, moving hand over hand on the fall, places one foot against the lower crossbar, and holds on. Nos. 8 and 9 pass the running end of the fall from below upwards three times round the foot of the cheek farthest from the end of the windlass on which the turns are; then bring the end up in rear of the crossbar in front of the windlass and hand it to 2 and 3, who make a stopper hitch on the fall close above the windlass. seizing the end to the fall with a piece of spun yarn. Nos. 8 and 9 haul in the slack between the hitch and foot of the cheek, tightening the turns round the foot, and hold well on. No. 6 then eases off the fall from the windlass until the weight is thrown on the foot of the cheek, when he shifts the turns.

If the operation of shifting is required to be performed often, a gasket should be placed round the cheek, below the lower crossbar on the side on which the running end of the fall comes off, to be used as a stopper.

"*Unstopper.*" The levers are worked, or, with light weights, the fall eased off by Nos. 8 and 9. until the strain is transferred from the foot of the cheek back to the windlass. Nos. 2 and 3 then cast off the stopper hitch; 8 and 9 clear the fall from the foot of the cheek, and the levers are worked as before.

"*High enough,*" "*Make fast.*" As soon as these orders are given, Nos. 7, 8, 9 let go the fall, No. 6, moves in, hand over hand, towards the windlass until his right hand is about 12 inches from the barrel; he then halts, presses down the fall with his right hand, and with his left passes a bight of it between the

windlass and lower crossbar, assisted by 7, then passes his left hand under the same bar, brings the bight out under it, takes a firm grasp of the fall with his left hand and hauls it upwards. With his right hand he then passes a long bight of the running part of the fall above the windlass, inside of the return which is between the windlass and upper crossbar, hauling the bight well through. He then takes hold of the bight with his right hand, back upwards, and hauls it down with both hands until it is jammed between the fall and windlass, and finally makes a half-hitch with the bight round the whole of the returns of the fall, just below the windlass.

"*Out levers.*" Nos. 2 and 3 withdraw them, and place them on the ground outside the cheeks.

To Lower a Gun suspended by a Gyn.

Prepare to lower.
Lower.
Over-haul and unsling.

"*Prepare to lower.*" No. 6 carefully casts off the hitch he made on the returns, clears away the fall, places his right foot against the lower crossbar, and with his body thrown back holds on the fall, 7 stretching it to the rear.

"*Lower.*" No. 6 eases off the fall, hand over hand without jerks, and allows the gun to descend gently.

If the fall will not run, No. 6 eases it off by raising his hands, he must, however, take care not to ease off too quickly.

If that be not sufficient, he pushes the standing end from him, easing the turns on the windlass with his left hand, the other Nos. holding on.

If the fall runs too freely, No. 6 checks it by lowering his hands and pressing it against the windlass.

"*Over-haul and unsling.*" The gun is unslung, and the sling removed by the same Nos. that slung it. No. 6 easing off the fall to facilitate the operation.

TO STRIKE THE GYN.

Prepare to strike the gyn.
Strike the gyn.
Unhook tackle.

"*Prepare to strike the gyn.*" No. 10 hooks the lower block to the upper crossbar, and with 11 hauls in the slack, taking a half-hitch round the point of the hook. Nos. 6 and 7 take the fall off the barrel of the windlass, 6 lays it down on the right of the gyn; 2 and 3 use handspikes, as in raising; 4, 5, 6, 7, 12, and 13 stand facing their respective cheeks ready to receive them; 8, 9, 10, and 11 man the handspike placed through the prypole-ring.

"*Strike the gyn.*" The Nos. at the prypole walk forward, keeping the foot close to the ground. The Nos. at the cheeks step back towards the head of the gyn, supporting the cheeks as they descend, placing themselves so that they may be outside of the cheeks when lowered. Nos. 2 and 3 bear well against the lower crossbar with their handspikes to prevent the cheeks from slipping out. When low enough, "*Unhook tackle.*" No. 10 unhooks the lower block from the crossbar, 11 the upper block from the shackle, and together lay the tackle on the ground to the right of the gyn.

TO TAKE THE GYN TO PIECES.

"*Take the gyn to pieces.*" Each No. undoes the work which he performed in putting the gyn together.

TO RAISE AND WORK THE GYN WITH SIX MEN.

No. 1 makes fast a drag rope to the foot of the prypole, then takes a turn with the other end of the same rope round the barrel of the windlass, securing it to the mortice hole. Then places a lever in the socket, with which he works the windlass.

No. 2. guides the prypole in.

The remaining Nos. lift at the head as long as required, after which they assist at the lever.

MOUNTING AND DISMOUNTING ORDNANCE WITHOUT GYNS.

ELEMENTARY INSTRUCTION.*

General Duties.

Nos. 2, 3, 4, and 5. Muzzle handspikemen.

Nos. 6 and 7. Place short skidding, scotches, rollers, fulcrums for the handspikes or levers, and assist to lash steadying handspikes.

Nos. 8 and 9. Place and attend to steadying handspikes, make arrangements for slewing the trunnions, and supply 6 and 7 with rollers, if not engaged in steadying the gun.

Nos. 10 and 11. Place drag-ropes on the breech and muzzle, the former on the muzzle, the latter on the breech.

Nos. 8, 9, 10, and 11. Place long skids and planks.

Nos. 12, 13, 14, and 15. Breech handspikemen.

When two parbuckle ropes are used, they are fixed by Nos. 6 and 12, 7 and 13; 12 and 13 fix the standing ends, 6 and 7 pass the running ends round the gun. The even Nos. haul on the muzzle, the odd on the breech; Nos. 2 and 3, or 2, 3, 4, and 5, assist with handspikes and scotches.

When one parbuckle rope is used, Nos. 6, 7, 12, and 13 pass it round the gun in rear of the trunnions the requisite number of times and 13 either makes it fast to one of the trunniens, or holds on to the end, as required.

In fixing tackles, Nos. 10 and 11 fix the standing blocks, 12 and 13 the moveable; the highest Nos. attend to the running ends.

Before commencing any exercise it should be ascertained that the men know their several duties by proving the Nos., thus, "*Muzzle handspikemen*," "*Prove*," &c.

* From Manual of Artillery Exercises, 1873.

Levers.—First Order.

When the fulcrum is between the weight and the power applied to move it, the handspike is used in the 1st Order of the lever.

Ex: At "*Elevate*," with guns on garrison standing carriages, 2 and 3 apply their handspikes as levers of the 1st order, the fulcrum being the step of the carriage, and the weight to be raised being the breech of the gun.

Levers.—Second Order.

When the weight is between the power and the fulcrum the handspike is used in the 2nd Order of the lever.

Ex: Running up and back with guns on garrison standing carriages, the handspikes are applied as levers of the 2nd Order.

Fulcrums.

The term *fulcrum* means a support for a lever.

Any piece of strong timber of suitable dimensions may serve the purpose.

To Slew the Trunnions of a Gun

Is to turn the gun on its axis, so as to bring the trunnions into any required position.

The trunnions may be slewed to bring them horizontal, or vertical, by attaching a lever or handspike to a trunnion, and scotching up under the gun with a piece of iron on the side towards which it is to be turned. Or by passing the bight of a rope round the gun once or twice, and placing the point of a lever or handspike through it, and bearing down or lifting up, using the gun as a fulcrum, the ends of the rope being held to prevent them slipping, the gun being scotched as before. The friction of the gun on the skids should be reduced, as far as possible, by wetting them. Nos. 8 and 9 place slewing handspikes on the trunnions.

To Slew a Gun End for End

Is to turn it round, not allowing it to revolve on its longer axis.

Skidding is placed under the gun, as near the centre of gravity as possible, and a lever put in the bore; Nos. 8 and 9 with handspikes prevent the gun rolling as the muzzle is carried round in the direction required; the skidding is adjusted, as necessary, by 6 and 7.

To Cut a Gun.

To cut a gun is to cause it to move horizontally, without rolling, by moving breech and muzzle alternately in the required direction.

The skids on which the gun to be cut rests should be close under its centre of gravity.

The end of the gun opposite to that to be moved should be scotched up.

To Pinch a Gun.

Pinching is the operation of moving a gun by small heaves of the handspike, without allowing it to turn on its axis.

To Parbuckle a Gun.

Parbuckling is the operation of rolling a gun by means of ropes (parbuckle ropes) passing round it, which operation may be performed when the gun rests on skidding sufficiently high to allow of its trunnions revolving without touching the ground.

As the breech is larger than the chase, it advances more rapidly, which must be corrected from time to time. This is done either by scotching up the breech and hauling forward the muzzle, or when on an incline by scotching up the muzzle and pinching back the breech. Neither should be done too much, otherwise the trunnion will be stopped by the skid.

In fixing a standing parbuckle rope it is passed by 6 and 7 round the gun four or five times, and then made fast to one of the trunnions by 12 and 13, the running end coming off next the breech; in the case of a running parbuckle rope, three turns may be taken, and 12 and 13, assisted if necessary by 6 and 7, hold on to the end; the running end in this case comes off next to the

trunnions. In parbucking a gun up an incline, the running end should come off above the gun; down an incline the reverse. When two parbuckle ropes are used, the running ends should come off away from the trunnions.

To Row a Gun.

Rowing is the operation of moving a gun in the direction of its length.

The handspikemen on each side apply their handspikes on the skids on which the gun rests,* under the gun, as levers of the 1st order, the small ends being in the direction it is intended to move the gun; a dragrope is attached to the breech or muzzle, as required, to be hauled on by all the remaining Nos. of the detachment.

At "*Row*" and "*Heave*" the Nos. bear down, and bring the small ends smartly in the direction opposite to that in which the gun is to move, moving together as in rowing a boat; the Nos. on the dragrope hauling at the same time.

If possible, the gun should have a safe inclination in the direction it is to move. Nos. 6 and 7 attend to scotching up.

To Move a Gun on Rollers.

One roller is placed under the gun, in rear of the centre of gravity, and another in front, at the same distance from the breech roller that the latter is from the breech end of the gun.

"*Fix steadying handspikes.*"—Nos. 8 and 9 each lay a 7-foot handspike over the gun, bevel down, so that the points may be over the trunnions on the opposite side. No. 8 makes a timber hitch on the right trunnion with the lashing rope and takes three or four turns round his own handspike, the point of that of 9, and the trunnion. No. 9 makes fast his own handspike and that of 8 in the same way, they frap the returns at the same time, and make fast with a clove hitch, 6 and 7 holding the handspikes in their places whilst they are being lashed, 8 and 9 then man them.

* It will generally be necessary to place extra fulcrums for this operation.

"*Fix muzzle* (*breech*) *dragrope.*" "*Heave.*"— When the rear roller leaves the gun, the front roller should be under the centre of gravity. Nos. 6 and 7 have a third roller ready, and as the muzzle rises, place the roller so as to receive the muzzle when it dips. This roller must be so placed that it will arrive under the centre of gravity as the other leaves the gun; the rollers should be at right angles to centre of gravity of gun.

If it is desired to change direction to the right or left the front roller should be cut in the required direction, and the rear roller in the contrary direction. Nos. 6 and 7 using mauls as required.

Rollers move over only half the space traversed by the weight they support.

TACKLES.*

The following tackles are used in the Artillery service :—

(1) *One fixed block* which gives no mechanical advantage.

(2) *One moveable block* which doubles the power.

(3) "*A luff tackle*" consists of a double and single 8″ block, with a fall of 2½″ rope, which when the single block is moveable, trebles the power; when the double, it increases the power fourfold.

(4) "*A gun tackle*" consists of two double blocks. When the standing end of the fall is made fast to the moveable block the power is increased fivefold; when made fast to the other, fourfold.

(5) "*A heavy gun tackle*" or "*light gyn tackle*" consists of a double and treble block, which increases the power five or six times as used.

(6) "*A medium or heavy gyn tackle*" consists of two treble blocks, and a power of six or seven is gained.

(7) "*A whip-upon-whip*" consists of two treble blocks, one of which is applied to and acts upon the running end of the fall of the other. It increases the power fourfold. There is less friction in this combination than in a luff tackle; it is used in running back at drill.

* From Manual of Artillery Exercises, 1873.

(8) "*A runner tackle.*" A tackle applied to the end of a rope passing through another block is called a runner tackle.

To Raise 64-pr. R.M.L. Guns and under, on Garrison Standing Carriages out of the Trunnion Holes, and the Converse.*

Strength of detachment, the gun detachment, and 5 additional gunners.

Stores Required.

The stores belonging to the gun and the following :—

Handspikes - - - - - -	3
Scotches - - - - - - -	8
Skids, $3' \times 4'' \times 4''$ - - - - - -	3

"*Raise the gun out of the trunnion holes.*" "*Prepare to bear down the muzzle.*"—No. 2 places a handspike in the bore, and 3 one over it, the point projecting out of the bore about six inches, double manned by 8 and 9 ; 4 places one over and across that of 2, close to the muzzle, double manned by 5, 10, and 11 ; 12 places one over and across the neck of the piece, double manned by 13, 14, and 15, the whole looking towards the gun. Nos. 6 and 7 will have short skids and scotches ready.

The commands "*Bear down,*" "*Come up,*" "*Lift,*" and "*Lower,*" are given, and skidding shifted by 6 and 7, until the gun is sufficiently high. No. 1 must see that 6 and 7 scotch up correctly, also that the carriage is scotched up.

In shifting handspikes to lift after bearing down, No. 4 shifts his under those in the bore, 12 shifting his underneath the neck of the piece.

(No scotch should ever be placed under a weight which is to rest on skids, &c., until such weight is fairly resting on the same.)

To Mount or Dismount a Gun on a Garrison Standing Carriage by Parbuckling Over the Side.*

Strength of detachment, two gun detachments.

* From Manual of Artillery Exercises, 1873.

Stores Required.

The stores belonging to gun and the following :—

Dragropes, heavy - - - - - -	2
Handspikes - - - - - - -	3
Parbuckle ropes - - - - - -	2
Scotches - - - - - - -	8
Skids, $14' \times 8'' \times 8''$ - - - - -	2
,, $3' \times 9'' \times 6''$ - - - - -	2
,, $3' \times 6'' \times 6''$ - - - - -	2
,, $3' \times 4'' \times 4''$ - - - - -	2

To Mount the Gun.

"*Place Skids,*" "*Fix Parbuckle Ropes.*"
"*Taut,*" "*Heave,*" "*Hold on.*"
"*Forward the Muzzle,*" "*Pinch back the breech*"
"*Heave,*" "*Remove skids, off parbuckle ropes.*"

The carriage is placed parallel to the gun, which is resting on short skids, at the length of the long skids from it, the trunnion holes being opposite the trunnions.

"*Place skids,*" "*Fix parbuckle ropes.*"—One end of the muzzle skid is placed just in front of the trunnion hole, and one end of the breech skid just in front of the ovolo, bevels up, both skids parallel to each other, and perpendicular to the carriage ; the ends which rest on the carriage are not to project above two inches on the inside of the cheeks ; Nos. 8 and 10 place the muzzle skid, and 9 and 11 the breech one.

The standing end of the muzzle parbuckle rope is fastened to the fore axletree by No. 12, and that of the breech to the eyebolt, on the side of the carriage furthest from the gun, by 13, the running ends are passed over the carriage under and round the gun by 6 and 7, who pass them back to 12 and 13.

Pieces of short skidding are placed across the trunnion holes by No. 6, and the upper step of the carriage by 7 ; their upper surfaces being on the same level as the bevelled ends of the parbuckling skids.

"*Taut.*"—Nos. 2, 3, 4, and 5 apply their handspikes under the gun to assist in rolling it on to the skids; the parbuckle ropes are stretched out and manned by all the Nos., the even Nos. on the muzzle, the odd Nos. on the breech; the handspikemen standing clear of the skids.

"*Heave.*"—The Nos. heave until the breech is so far forward that the shoulder of the trunnion will catch against the skid. "*Hold on,*" is then given.

"*Forward the muzzle.*"—Nos. 2 and 4 place their handspikes in the bore and assist to get the muzzle forward, the muzzle parbuckle rope being hauled on at the same time. "*Pinch back the breech.*"—Nos. 3 and 5 shift to the other side of the gun, and pinch the breech back, the breech parbuckle rope being eased off. When the gun is in a position to be again moved forward the word "*Heave*" is repeated, and so on until the gun arrives at the top of the skids, when the trunnions should be opposite trunnion holes. The gun is now pinched or allowed to roll on to the short skids, care being taken to check it when necessary by placing scotches on the short skids. Should the vent not be in the proper position, the trunnions must be slewed. Skids, &c., being removed, the gun is lowered into its place.

To Dismount the Gun

Is exactly the converse of the above. (The gun must first be raised out of the trunnion holes).

When a handspike is placed in the bore while dismounting, the Nos. manning it must be on the side of the gun away from the direction in which it is being lowered.

To Dismount and Mount the 40-pr. B.L.R. Gun.

(By the Gun Detachment only.)

Stores required (in addition to gun stores.)

Oak skids (special) 5″ × 5″	2
Drag ropes (heavy)	1
Luff tackles	2
Straps	2
Ground roller	1

To Dismount the Gun.

"*Prepare to dismount the gun.*"

No. 1 removes sights, 2 and 3 breech fittings and cap squares.

1 hooks a dragrope to the breech. 7 removes elevating screw.

2 places handspike in bore, double manned by 3.

4 and 5 scotch wheels, 4 in front, 5 in rear; 4 applies his handspike over and across the muzzle, double manned by 5.

"*Bear down and place skids.*"

The skids are placed by 8 and 10, 1 and 9, and the grummets are passed over the capsquare bolts by No. 1.

No. 6 places two handspikes on the ground under the lower ends of the skids, or a piece of skidding.

No. 7 places the ground roller to receive the gun; 8 and 9 then double man No. 4's handspike; 1, 6, 7, and 10 on the dragrope.

"*Prepare to lift.*"

"*Lift and Heave.*"

till the gun descends on to the ground roller.

To Mount the Gun.

"*Place skids,*" "*Hook tackles.*"

The skids are placed by 8 and 10; 1 and 9 (as above).

No. 1 secures a strap for the double blocks, thus:—an ordinary strap is doubled, and two ends passed through vent-slot and breech. A handspike is passed through centre of strap over vent-slot, and the double blocks are hooked into ends of strap.

No. 10 places strap in front across cheeks of carriage; 1 and 10 hook the single, 6 and 7 the double blocks.

No. 1 puts a handspike in the bore and mans it till the gun is resting on the skids; 2 and 3 apply their handspikes under the trunnions while the gun is moving on the roller.

4, 5, 6, 7, 8 and 9 man the tackles on their own sides.

"*Heave*" till the gun is resting on the skids.

No. 1 then removes his handspike, the falls are passed inside the wheels and manned by all the numbers till the gun is in the trunnion holes.

"*Remove skids,*" "*Unhook tackles,*" (by the Nos. who placed them), 7 replaces elevating screw; 2 and 3 capsquares and breech fittings.

NOTE.—Extra numbers are sometimes employed to assist in these operations, but the gun should be dismounted and mounted again by a smart gun detachment without difficulty.

TO MOUNT OR DISMOUNT A GUN ON A GARRISON STANDING CARRIAGE, BY LONG SKIDS UP OR DOWN THE REAR.*

WITHOUT ROLLERS.

Strength of detachment, two gun detachments.

STORES REQUIRED.

The stores belonging to the gun and the following :—

Dragropes, heavy	2
Handspikes	3
Luff tackles, complete	2
Roller, ground	1
Scotches	8
Skids, $14' \times 8'' \times 8''$	2
,, $3' \times 4'' \times 4''$	2
Straps or selvagees	2

TO MOUNT THE GUN.

The gun should be placed on the ground roller, which should be as near the centre of gravity as possible; the carriage brought up in front, the wheels scotched, and capsquares removed.

"*Place skids, hook tackles.*"

"*Taut, heave.*"

"*Remove skids, unhook tackles.*"

"*Place skids, hook tackles.*"—Nos. 8, 9, 10 and 11 place the skids the lower ends resting on the ground, bevel down, under the muzzle; the upper, bevel up, between the cheeks of the carriage, so that they may be easily removed when the gun is mounted, and also admit of the trunnions clearing the capsquare bolts in coming up; they are then lashed by 8 and 9 so as to

* From Manual of Artillery Exercises, 1873.

prevent them from moving up with the gun. The tackles are then hooked, Nos. 12 and 13 hooking the double blocks to a strap round the breech, 10 and 11 the single to a strap round the breast of the carriage; the skids are then watered.

"*Taut, heave.*"—The Nos. man the tackles on their own sides, and haul in the slack, and the gun is pulled up the skids, until the trunnions rest on the points of handspikes placed in the trunnion holes by 6 and 7.

"*Remove skids, unhook tackles.*"—The muzzle is borne down, and the skids and tackles cleared away by the Nos. who placed them, Nos. 6 and 7 working out their handspikes, 2 and 3 replacing the capsquares.

To Dismount the Gun.

Is the converse of the foregoing, except no tackle is required, but a dragrope must be made fast to the breech, to haul the gun down, as soon as the weight is thrown on to the skids, whilst the Nos. lift at the muzzle.

With Rollers.

Stores Required.

As above; also,

Mauls - - - - - - -	2
Rollers 14″ × 5″ - - - - - - -	1
,, 24″ × 5″ - - - - - - -	2

To Mount the Gun.

The gun should be resting on a ground roller, nearly under the its centre of gravity, and the carriage placed in front of it.

"*Place skids, hook tackles.*"

"*Taut.*"

"*Heave.*"

"*Remove skids, unhook tackles.*"

"*Place skids, hook tackles.*"—Nos. 8, 9, 10, and 11 place skids, the upper ends bevel up, resting on breast transom, lower ends on ground under muzzle; upper surfaces high enough for trunnions to clear top step. No. 8 passes handspike through breeching loop

to 9; if there be none, steadying handspikes are fixed. No. 11 places strap over neck of cascable and passes ends down between handspike and breech, crossing ends underneath, and bringing them over and round handspike; 12 and 13 hook double blocks to them, 10 and 11 single blocks to strap placed across front of carriage by 10; 6 and 7 scotch trucks. All Nos. man tackles except 6 and 7, who attend to rollers, and 8 and 9 who man steadying handspikes.

"*Taut.*"—The Nos. on the tackles haul in the slack. Nos. 6 and 7 place a 24″ roller on the skids ready to receive the muzzle when it dips; this roller should be under the centre of gravity when the ground roller leaves the breech, in order that this may be so, it is frequently necessary to lift the muzzle and shift the roller back.

"*Heave.*"—The Nos. heave on the tackles, both sides working together; the rollers being at the same time kept perfectly square, otherwise the gun will be liable to slew, and so tip over. The 14″ roller should be placed so that when the trunnions arrive over the trunnion holes, the roller will be a little in rear of the centre of gravity.

When the gun is nearly high enough, a 4″ skid is laid across the trunnion holes. Nos. 2 and 3 handspikes in bore, double manned by 4 and 5, ready to lift or bear down muzzle as required. The skids, &c., being removed, the gun is lowered into the trunnion holes.

To Dismount the Gun.

"*Raise the gun out of the trunnion holes.*"
"*Place skids, hook tackles.*"
"*Bear down the muzzle.*"
"*Raise the muzzle.*"
"*Ease off.*"

When tackle is hooked, a turn is taken with running ends round front axletree arms, Nos. 18 and 19 holding on. The muzzle is borne down and the 14″ roller placed as near centre of gravity as possible; it is then raised and the tackle eased off by

Nos. 18 and 19, till the breech dips on to the 24″ roller placed on skids to receive it. The Nos. then man tackles and ease off till gun descends on ground roller, when Nos. above 10 quit tackles and man dragrope fixed by 11 on breech.

To Dismount a Gun from a Garrison Standing Carriage by Rolling it over the Side.*

Strength of detachment,—two gun detachments.

Stores Required.

The stores belonging to the gun, and the following :—

Dragropes, heavy - - - - - -	2
Scotches - - - - - - - -	4
Skids, 3′ × 9″ × 6″ - - - - -	2
,, 3′ × 4″ × 4″ - - - - -	2

"*Raise the gun out of the trunnion holes.*"

When high enough the gun is slewed sideways till it is nearly over the cheek, (6 and 7 scotching up). Two 6″ × 9″ skids are placed against the sides of the carriage to protect the trucks. No. 11 takes a turn round the gun with a dragrope, making fast the standing end to one of the trunnions. All the Nos. except 6 and 7 man the dragropes.

"*Unscotch.*" "*Heave.*"

The Nos. on the drag rope heave smartly, and the gun falls on to the ground clear of the carriage. This operation should be performed with the gun carriage placed so that the gun will fall on soft ground and not on the platform.

To Shift a Gun from a Garrison Standing Carriage to Another by Slewing.*

Strength of detachment, two gun detachments.

Stores Required.

The stores belonging to the gun, and the following :—

Scotches - - - - - - - -	6
Skids, 3′ × 4″ × 4″ - - - - -	2

* From Manual of Artillery Exercises, 1873.

Raise the gun out of the trunnion holes.
Lift and slew.
Bear down and slew.

The gun is raised out of the trunnion holes and supported on two 4″ skids, one through the trunnion holes, the other across the top step of the carriage. The spare carriage is then placed close alongside the other, so that the trunnion holes are opposite.

"*Lift and slew.*"—The muzzle is lifted and carried towards the spare carriage; and at "*Bear down and slew,*" the muzzle is borne down and the breech moved in the same direction, and so on, shifting the short skids as required, first to bridge over the interval between the carriages, and afterwards to support the gun on the spare carriage.

Care must be taken at all times to keep the gun supported so that the trunnions are rather in rear of the trunnion holes. This is a very simple and expeditious method of shifting a gun, but requires to be very carefully carried out, the muzzle being invariably moved first.

To Shift a Gun from one Garrison Carriage to another by Rowing.*

Strength of detachment, two gun detachments.

Stores Required.

The stores belonging to the gun, and the following:—

Dragropes, heavy - - - - - -	2
Handspikes - - - - - - -	3
Scotches - - - - - - - -	8
Skids, 3′ × 9″ × 6″ - - - - -	2
,, 3′ × 6″ × 6″ - - - - -	2
,, 3′ × 4″ × 4″ - - - - -	2

Raise the gun out of the trunnion holes.
Prepare to row to the front.
Row and heave.

* From Manual of Artillery Exercises, 1873.

The gun is raised out of the trunnion holes on to a 6″ skid placed through the trunnion holes, the breech resting on a 6″ × 9″ on the top step of the carriage. The spare carriage is run under the muzzle of the gun as close to the other carriage as possible, and the trucks scotched. A 6″ × 9″ skid is placed on its flat on the top step of the spare carriage, and slightly greased where the muzzle of the gun will touch.

"*Prepare to row to the front.*"—The handspike Nos. apply their handspikes for rowing. No. 10 fixes a dragrope to the muzzle, which is manned by all the remaining Nos. except Nos. 1, 6, and 7; 6 and 7 stand ready with scotches to prevent the gun rolling over.

"*Row and heave.*"—The gun is worked forward, and drops into its place in the spare carriage.

To Shift a Gun from one Travelling Siege Carriage to another, muzzle or breech foremost.*

Strength of detachment, two gun detachments.

Stores Required.

The stores belonging to gun, and an extra gun roller, a plank, and two lashing ropes.

Raise the gun out of the trunnion holes.
Fix steadying handspikes, breech and muzzle dragropes.
Place plank and rollers. Taut. Heave.

The gun is raised out of the trunnion holes, the trunnions resting on points of handspikes placed in the trunnion holes. The new carriage is placed in front, (or rear) as close to the other as possible, and the wheels scotched. Nos. 8 and 9 fix steadying handspikes, and 10 and 11 the dragropes. Nos. 10 and 11 also place the plank so that it rests fairly on the breasts of both carriages, but so that the end to which the gun is travelling does not interfere with the trunnion holes, the leading roller being placed so

* From Manual of Artillery Exercises, 1873.

that when the trunnions are over the trunnion holes of the new carriage it may be as nearly as possible under the centre of gravity of the gun. The dragrope is hauled on till the gun is brought over the trunnion holes, when dragropes, &c., are cast of, and the gun lowered into the trunnion holes.

The operation of shifting from garrison to travelling, or from one garrison carriage to another, &c., are performed in the same manner, the following stores being required, viz. :—The stores belonging to the gun, and also 2 heavy dragropes, 2 handspikes, 2 lashings, 1 plank, 2 rollers, 14″ × 5″, 8 scotches, and 2 skids, 3′ × 4″ × 4″.

The standing carriage is placed close in front of the travelling carriage.

The upper surface of the cheeks of both carriages must be on same level, which may be arranged either by sinking the wheels of the travelling carriage, or raising the trucks of the standing one on planks or skids.

The plank should be supported where necessary between the points of bearing.

RANGE TABLE FOR 64-PR. M.L.R. GUN.—Continu

Distance of Object.	Elevation.	Fuze.		Distance of Object.	Elevation.	Time of Flight.
		Tenths.	Corresponding Range.			
yds.	° ′		yds.	yds.	° ′	° ′
2100	4·48	12	1850	2100	6·19	7·93
2200	5·6	13	1980	2200	6·48	8·44
2300	5·25	14	2110	2300	7·18	8·96
2400	5·44	15	2235	2400	7·50	9·49
2500	6·4	16	2355	2500	8·23	10·03
2600	6·25	17	2475	2600	8·57	10·58
2700	6·45	18	2595	2700	9·31	11·14
2800	7·6	19	2715	2800	10·6	11·71
2900	7·28	20	2830	2900	10·42	12·29
3000	7·50	21	2945	3000	11·18	12·88
3100	8·13	22	3060	3100	11·55	13·48
3200	8·36	23	3170			
3300	9·0	24	3280			
3400	9·24	25	3385			
3500	9·49	26	3490			
3600	10·14	27	3595			

RANGE TABLES.

RANGE TABLE FOR 64-PR. M.L.R. CONVERTED GUN OF 58-CWT.

Rifled Common and Shrapnel Shell of 64-lbs.				Spherical Solid Shot of 32-lbs.		
Charge, 8-lbs. L.G. powder.						
Distance of Object.	Elevation.	Fuze. Tenths.	Fuze. Corresponding Range.	Distance of Object.	Elevation.	Time of Flight.
yds.	° ′		yds.	yds.	° ′	° ′
100	0·10	1·0	175	100	0·9	0·25
200	0·21	1·5	265	200	0·18	0·52
300	0·32	2·0	350	300	0 28	0·80
400	0·43	2·5	430	400	0·39	1·09
500	0·55	3·0	510	500	0·51	1·39
600	1·7	3 5	593	600	1·4	1·71
700	1·19	4·0	670	700	1·18	2·04
800	1·32	4·5	750	800	1·33	2·38
900	1·45	5·0	830	900	1·40	2·73
1000	1·58	5·5	910	1000	2·6	3 10
1100	2·12	6·0	985	1100	2·24	3·48
1200	2·26	6·5	1065	1200	2·43	3·88
1300	2·40	7·0	1140	1300	3·2	4·29
1400	2·55	7 5	1215	1400	3·21	4·70
1500	3·10	8·0	1290	1500	3·42	5·13
1600	3·25	8·5	1365	1600	4·5	5·57
1700	3·41	9·0	1435	1700	4·29	6·02
1800	3·57	9·5	1505	1800	4 54	6·48
1900	4·14	10	1575	1900	5.21	6·95
2000	4·31	11	1715	2000	5.51	7·43

RANGE TABLE FOR 64-PR. M.L.R. GUN.—Continued.

Distance of Object.	Elevation.	Fuze.		Distance of Object.	Elevation.	Time of Flight.
		Tenths.	Corresponding Range.			
yds.	° ′		yds.	yds.	° ′	″ ′
2100	4·48	12	1850	2100	6·19	7·93
2200	5·6	13	1980	2200	6·48	8·44
2300	5·25	14	2110	2300	7·18	8·96
2400	5·44	15	2235	2400	7·50	9·49
2500	6·4	16	2355	2500	8·23	10·03
2600	6·25	17	2475	2600	8·57	10·58
2700	6·45	18	2595	2700	9·31	11·14
2800	7·6	19	2715	2800	10·6	11·71
2900	7·28	20	2830	2900	10·42	12·29
3000	7·50	21	2945	3000	11·18	12·88
3100	8·13	22	3060	3100	11·55	13·48
3200	8·36	23	3170			
3300	9 0	24	3280			
3400	9·24	25	3385			
3500	9·49	26	3490			
3600	10·14	27	3595			

RANGE TABLE FOR 40-PR. B.L. GUN.

Distance of Object.	Elevation.	Lengths of Fuze.	Distance of Object.	Elevation.	Lengths of Fuze.
yds.	° ′	ins.	yds.	° ′	ins.
100	0·10	0·05	2100	5·27	1·35
200	0·21	0·10	2200	5·45	1·40
300	0·33	0·15	2300	6·04	1·45
400	0·45	0·20	2400	6·24	1·55
500	0·58	0·25	2500	6·44	1·60
600	1·12	0.35	2600	7 05	1·70
700	1·27	0 40	2700	7·27	1·75
800	1·42	0 50	2800	7·49	1·85
900	1·57	0·55	2900		
1000	2·13	0·60	3000		
1100	2·29	0·65	3100		
1200	2·46	0·75	3200		
1300	3·03	0·80	3300		
1400	3·21	0·85	3400		
1500	3·39	0·95	3500		
1600	3·57	1·00	3600		
1700	4·15	1·05	3700		
1800	4·33	1·10	3800		
1900	4·51	1·20	3900		
2000	5·09	1·25	4000		

RANGE TABLE FOR 7-INCH B.L. GUN.

Distance of Object.	Elevation.	Lengths of Fuze.	Distance of Object.	Elevation.	Lengths of Fuze.
yds.	° ′	ins.	yd.	° ′	ins.
100	0·09	0·05	2100	5·27	1·35
200	0·21	0·10	2200	5·47	1·40
300	0·33	0·15	2300	6·07	1·50
400	0·45	0·20	2400	6·27	1·55
500	0·58	0·30	2500	6·47	1·65
600	1·11	0·35	2600	7·07	1·70
700	1·25	0·45	2700	7·27	1·75
800	1·40	0·50	2800	7·47	1·85
900	1·55	0·55	2900	8·07	1 90
1000	2·10	0·60	3000	8·27	2·00
1100	2·26	0·70	3100	8·47	
1200	2·43	0 75	3200	9·07	
1300	3·00	0·80	3300	9·27	
1400	3·17	0·90	3400	9·47	
1500	3·34	0·95	3500	10·07	
1600	3·52	1·00	3600	10·27	
1700	4·11	1·10	3700		
1800	4·30	1·15	3800		
1900	4·49	1·20	3900		
2000	5·08	1·30	4000		

Smooth-Bore Ordnance.

Range.	68-Pr. 95 Cwt. Shot and Shrapnel Shell, 16 lbs.		Common Shell, 16 lbs.	
Yards.	Elevation. °	Fuze. Inches.	Elevation. °	Fuze. Inches.
400	P.B.		P.B.	
500	¼		¼	
600	½		½	
700	¾		¾	
800	1	·2	1	
900	1½	·3	1	·2
1000	1¾	·4	1¼	·3
1100	1¾	·5	1½	·4
1200	2	·6	1¾	·5
1300	2¼	·7	2	·6
1400	2½	·8	2¼	·7
1500	3	·9	2½	·8
1600	3¼	1·0	3	1·0
1700	3½		3¼	1·0
1800	4		3½	1·1
1900	4¼		4	1·2
2000	4½		4½	1·3
2100	5		5	1·4
2200	5¼		5¼	1·5
2300	6		6	1·6
2400	6½		6½	1·7
2500	7		7	1·8
2600	7½		7½	1·9
2700	8		8	2·0
2800	8½		8½	
2900	9		9	

SMOOTH-BORE ORDNANCE—Continued.

Range.	32-Pr. 63, 58, and 56 Cwt.				32-Pr. 50 Cwt.			
	Shot and Shrapnel Shell, 10 lbs.		Common Shell, 10 lbs.		Shot and Shrapnel Shell, 8 lbs.		Common Shell, 8 lbs.	
Yards.	Elevation. °	Fuze. Inches.	Elevation. °	Fuze. Inches.	Elevation. °	Fuze. Inches.	Elevation. °	Fuze. Inches.
300					P.B.		P.B.	
400	P.B.		P.B.	·2	¼		¼	
500	¼	·2	¼	·2	¾	·2	¾	·2
600	¾	·2	¾	·3	1¼	·2	1¼	·3
700	1	·3	1	·3	1	·3	1¾	·3
800	1¼	·3	1¼	·4	1½	·3	1	·4
900	1½	·4	1½	·4	1½	·4	1½	·4
1000	1¾	·4	1¾	·5	1¾	·4	1¾	·5
1100	2	·5	1¾	·6	2	·5	2	·6
1200	2¼	·6	2	·7	2¼	·5	2¼	·6
1300	2¼	·7	2¼	·8	2¼	·6	2¼	·7
1400	3	·8	2¼	·9	2¾	·7	3	·8
1500	3¼	·9	3	1·0	3	·8	3½	1·0
1600	3¼	1.0	3½	1·1	3½	·9	4	1·1
1700	4		4	1·2	4	1·0	4½	1·2
1800	4¼		4½	1·3	4½		5	1·3
1900	4¾		5	1·4	5		5½	1·3
2000	5		5½	1·5	5½		6	1·4
2100	5¼		6	1·5	6		6½	1·5
2200	5¾		6½	1·6	6½		7	1·6
2300	6		7	1·7	7		7½	1·7
2400	6½		7½	1·8	7½		8	1·8
2500	7		8	1·8	8		8½	1·9
2600	7½		8½	1·9	8½		9	2·0
2700	8		9	1·9	9			
2800	8½		10	2·0	10			
2900	9							
3000	10							

SMOOTH-BORE ORDNANCE—Continued.

24-Pr. Gun. 50 and 48 Cwt.				
Range.	Shot and Shrapnel Shell, 8 lbs.		Common Shell, 8 lbs.	
Yards.	Elevation. °	Fuze. Inches.	Elevation. °	Fuze. Inches.
300				
400	P.B.		P.B.	
500	¼		¼	
600	½		½	
700	¾		¾	
800	1	·2	1	
900	1¼	·3	1¼	·2
1000	1½	·4	1½	·3
1100	2	·5	2	·4
1200	2¼	·6	2¼	·5
1300	2½	·7	2½	·6
1400	2¾	·8	3	·8
1500	3	·9	3½	·9
1600	3½	1·0	4	1·0
1700	4		4½	1·1
1800	4½		5	1·2
1900	5		6	1·3
2000	6		7	1·4
2100	7		8	1·6
2200	8		9	1·8
2300	9		10	2·0
2400	10			

SMOOTH-BORE ORDNANCE—Continued.

18-Pr. Guns. 38 or 42 Cwts.					
Range.	Shot and Shrapnel Shell. 6 lbs.		Common Shell. 6 lbs.		
Yards.	Elevation. °	Fuze. Inches.	Elevation. °	Fuze. Inches.	
300					
400	P.B.		P.B.		
500	¼		¼	·2	
600	½		½	·2	
700	¾		¾	·3	
800	1	·2	1	·3	
900	1¼	·3	1¼	·4	
1000	1½	·4	1½	·5	
1100	1¾	·5	1¾	·6	
1200	2	·6	2	·7	
1300	2⅛	·7	2⅛	·7	
1400	2¼	·8	2¼	·8	
1500	3	·9	3	·9	
1600	3½	1·0	3½	1·0	
1700	4	1·1	4	1·1	
1800	4½	1·2	4½	1·2	
1900	5	1·3	5	1·3	
2000	5½	1·4	6	1·5	
2100	6	1·5	7	1·7	
2200	6½	1·6	8	1·9	
2300	7	1·7	9	2·0	
2400	8	1·8			
2500	9	1·9			
2600	10	2·0			

COMPANY DRILL.

General Definitions.*

Alignment.—An imaginary straight line lying between two points, or the prolongation of that line, upon which troops are to form, or march.

Appui, Point of.—French, *appui*, "a support." The point of formation.

Company.—A certain number of files, under the command of a captain, divided into half-companies and sections.

Base Company, or Battalion.—The company, or battalion, from which a formation is regulated.

Base Points.—The points given by markers as a base for forming line in prolongation of that base.

Pivot.—The flank man on whom, or the point on which, a wheel is made.

Column.—A succession of companies (or parts of companies), from front to rear, parallel to each other.

Flank, Inner.—That nearest to the point of appui.

,, *Directing.*—That by which companies march.

,, *Outer.*—That opposite to the Inner Flank.

,, *Reverse.*—That opposite to the Directing Flank.

Distance.—The depth between men or corps, from front to rear.

Interval.—The lateral space between men or corps.

Front, change of.—Taking up a new alignment on a base at an angle to, and either touching or intersecting, the former alignment.

Echelon.—Echelon is when the line is broken into several parts, moving direct to the front or rear in succession. Oblique echelon is when the divisions of a line wheel less than the quarter circle, so as to be oblique to the former front and parallel with each other. Short echelon is formed by the two centre com-

Note.—Attention is directed to Method of giving Words of Command, (see note p. 99).

* From Field Exercise and Evolutions of Infantry.

GENERAL RULES.*

panies advancing, and the remaining companies of half-battalions following in succession at six paces distance.

Formation and telling off of a company.—The company will fall in in two ranks at close order, files nearly touching, and be numbered from right to left; it will then be told off into two half, companies and four sections. When the number of files is odd, the right half-company will be the stronger. When a half company is divided into sections of unequal strength, the outer section will be the stronger. The left file of the right half-company will always be considered the centre of the company.

Markers giving points.—1. A marker giving a point for his company to dress upon, in a line formation, will stand with recovered arms, turned towards the point of formation, at arm's length in front of the aligument; when the men approach he will hold out his inner arm at right angles to his body, with the fist clenched, on which the line will dress. Thus all lines will be dressed at arm's length in rear of the line of markers. A maker giving a point will drop his arm as soon as the man opposite to his fist has dressed up to it.

2. A marker, when giving a point for his company to form on in column, will recover arms while being covered, coming to "The Shoulder" when correctly covered, or when covered simultaneously with other markers, as when points are given for companies to form on parade, on the word *Steady*. When the guide comes up to take his place, the marker will fall to the rear.

Relative proportion of paces to files.—Each man occupies a spac of about 24 inches; therefore, to ascertain the number of paces of 30 inches required for a given number of files, multiply the number of files by 8, and divide by 10, the latter operation being accomplished by cutting off the last figure, which multiplied by 3 will give the odd inches. It will be useful to remember, that 10

* From Field Exercises and Evolutions of Infantry.

files require 8 paces, 20 files 16, and so on—100 files 80 paces, 1000 files 800.

Making way for an Officer, or Marker, to pass through the line.—When a mounted officer requires to pass through the line at any point, the two files at that point will take two paces to the rear and one pace outwards from each other, resuming their places when he has passed. When a guide has to make way for another officer, or a marker, to pass, he will take one pace to his front, and a side pace to his left, stepping back when the officer, or marker, has passed. Non-commissioned officers do not move out in front of the line at open order.

Sizing a company.—A company will be sized from flanks to centre, the front and rear rank men being nearly the same height. When a company is first sized, the following method will be adopted:—Having arranged the men in single rank according to their heights, tallest on the right, shortest on the left, direct the right-hand man to take three paces to the front, the next to place himself three paces in front of the left of the rank, as a left-hand man, the third tallest man to place himself one pace in rear of the right-hand man, the fourth in rear of the left-hand man; then place the two next on the inner side of the front rank men of the formed files, then the two next as their rear-rank men, the taller man in each case taking the right: and so on. Lastly, cause the half-companies to close inwards on each other and dress, the rear rank covering correctly; the blank file, if there is one, to be placed the third from the left.

Officers, &c., of a Company.—The commander of the company will be termed "the captain," the senior subaltern, "the right guide," and the junior subaltern "the left guide." Two sergeants will be told off as "right" and "left" markers. The guides and markers will form a third or supernumerary rank, two paces from the rear rank;—the right and left guides in rear of their flank files, the markers in rear of the second file from their guides: the remaining supernumeraries will take post alternately in rear of the right and left half-companies, dividing the space.

A Company in Line and Column.

1. *Formation in Line.*—On the caution AS A COMPANY IN LINE, the right guide will place himself on the right of the front rank, and his marker will cover him.

2. *Formation in Column.*—On the caution AS A COMPANY, BY THE LEFT (or RIGHT), the guide of the flank named to direct will align himself with the front rank, his marker placing himself in rear of the flank file.

3. *The Formation of Fours.*—Both in file marching and the flank march by fours, the guide of the leading flank will lead the company, being placed next to the pivot man of the leading file or four, with his marker in front of that man. The guide not leading the company will be on the reverse flank of the rear file or four; his marker on the reverse flank of the next file but one, or the next four. The supernumerary rank will close to the files they cover, as the company turns, or forms four, to a flank.

4. *Column of Half-companies and Sections.*—In column of half-companies, each guide will be on the directing flank of his half-company, his marker two paces in rear of the flank file; in column of sections, each guide will be on the directing flank of the outer section of his half-company, his marker on the same flank of the inner section; the remaining supernumeraries will retain their places.

A Company in Line taking open Order.

"*Open order.*"—Officers recover swords; guides place themselves one pace from front rank, left guide in front of second file from left, right guide in front of centre; captain (passing round right of company), one pace in front of second file from right. Should only one guide be present, he takes place assigned for left guide, passing by front. Supernumerary rank step back two paces; right marker takes one pace to his left into the space vacated by right hand man of rear rank, who steps back two paces and turns to his right.

"*March.*"—Officers take two paces to front, look to right and dress; right marker takes a side pace to his right and one to the front, into place vacated by his guide.

"*Steady.*"—Officers carry swords and eyes front.

"*Close Order.*"—Officers recover swords; captain and right guide turn to right; left guide to left.

"*March.*"—Officers take post; right marker takes two paces back, and one to left, to allow captain to pass—then steps up to cover his guide. If one guide only is present, he passes to right of company by the rear.

Non-commissioned officers acting as right guides stand fast at "*Open Order*;" markers and left guides move with rear and supernumerary ranks.

Marching to the Rear.

At "Line (or Column) will retire," the directing guide, if company is in line, will fall to rear of centre to superintend the movement; if in column he steps up in line with rear rank.

Wheeling or Forming into Line.

As a Company in Column by the Left.

"*Left wheel (or Left Form) into Line.*"—Left guide falls to rear, right guide moves up. Left marker marks at arm's length from left of company; right marker runs out and marks where right of company will rest; both markers turning to rear of column.

"*Steady.*"—"*Quick March.*"

Left guide moves to left of company, ready to dress it. Captain gives "*Halt,*" "*Dress,*" "*Eyes Front,*" "*Steady.*" A company in column by the right wheels to right in a similar manner, but left guide does not move on the caution; right hand man of rear rank steps up to keep right guide's place.

(If two or more companies are drilling together, all except the leading company have only their inner flanks marked.)

Wheeling from Line into Column.

Caution.—"*As a Company in Line.*"

"*Break into column to the right.*"—All turn right about except left guide who stands fast.

"*Right wheel—Quick march.*"—Left guide moves to left of company turning to front of column.

"At "*Halt, Front, Dress*" (from captain), the right guide and the markers take post in column.—(men dress themselves).

In "*Breaking into column to left,*" right guide stands fast, (remainder turning right about). At "*march,*" he moves to right of company, turning to front of column.

In wheeling forward into column, if wheel is to right, right guide and his marker fall to rear, left guide moving up as wheel is commenced ; if wheel is to left, right marker falls to rear.

When a company in files or fours forms to front, rear, right, or left, the markers mark the flanks of the company, turning towards point of formation The guide of the flank of formation dresses the men file by file as they come up.

A Company Changing Front as the Base Company of a Line Formation.

"*Change Front, Quarter, Half,* or *Three Quarters, Right* (or *Left*), or *To the Right* (or *Left*), *on the Right* (or *Left*) *Company,*"—or "*Change Front, Quarter, Half,* or *Three Quarters, Left* (or *Right*), or *To the Left* (or *Right*), *On the Right* (or *Left*) *Company.*"

Markers give base points, turning towards flank on which company is to wheel, if the change of front is to right on right company, or to left on left company ; but if the change of front is to the left on right company, or to the right on left company, they turn to where wheeling flank of company will rest.

"*Steady.*"—At this word, captain gives following executive words :—"*Company, Right* (or *Left*) *Wheel.—Quick March.—Halt, Dress.*"

The guide of flank on which wheel was made, dresses the company and gives "*Eyes Front,*" falling in on right if right guide, or to rear if left

"*Steady.*"—Markers take post.

Countermarching.

(From the Halt.)—"*Countermarch.*"—Directing guide turns

right about, and takes a pace to his front; guide of reverse flank places himself one pace from that flank, turning inwards.

"*Ranks Right and Left Turn.*"—Front rank turns to right, rear rank to left.

"*Quick March,*"—"*Halt, Front, Dress.*"—At Front, guides change flanks. Captain and supernumerary rank turn to reverse flank and countermarch round that flank.

(On the march.) "*Countermarch—Ranks Right and Left Turn.*"—Directing guide turns right about, takes a pace to his front, and marks time; the other guide moves as from the halt, but marks time.

At "*Front-turn,*"—Guides change their flanks.

Diminishing and Increasing Front, by Breaking off Files, and Bringing them again to the Front.

"*Break off*"—"*Files on the right or left.*"

Captain gives—"*Files on the right, left turn, right wheel.*"

If the files break off from the directing flank, the guide, on that flank will touch in to the remainder of his front rank, as the files drop to rear; his marker will move up and remain covering him as long as there is a file in rear.

Any number of files that have been broken off may be again ordered to the front as follows:—"*Files to the front.*"

If all are to be brought at once to the front, the word is "*Files to the front.*"

Forming Company Square.

"*Form company square.*"—

The captain gives:—"*Fours deep.*"—"*On the Centre.*"—"*Close.*"—"*Quick march.*" When the closing is completed, men fix swords; the flank fours, after fixing, turn outwards. The officers and sergeants form in rear of the company,

"*Prepare for Cavalry.*"—(See Carbine drill, page 102).—Officers and sergeants may, if necessary, move in between the fours, and the two rear ranks be turned about, the outer rank kneeling.

"*Order Arms.*"—As the men come to "*the order,*" the flank fours front, and officers and sergeants, if in the square, move out.

"*Re-form Company.*"—The captain gives—"*Unfix swords.*"—From the centre, re-form two deep, "*Quick march.*"

Formation of Half Companies and Sections.

"*Form square.*"—"*Quick march,*"—"*Half companies,*"—*Outwards.*" ; or,

"*Four deep, Form square.*"—"*Quick march.*"—"*Sections, Outwards.*"

"*Unfix swords.*"—"*Reform column.*"—"*Quick march.*"—"*Halt.*"—"*Front.*"—"*Dress.*"—"*Stand at ease.*"

In forming four deep square, the two inner sections will close on the outer on completing their wheel.

At "*Reform Column.*"—If the square is two deep, the half-companies turn about ; if four deep, the sections turn about and the two inner sections then move off to section distance from the outer.

At "*March.*"—The half-companies or sections will wheel into company, receiving the words—"*Halt.*"—"*Front.*"—"*Dress,*" when square.

Inspecting, Proving, and Dismissing.

Inspecting and Proving a Company.

A company on parade will be inspected as follows :—

Fix Swords.

Open Order—March.

The inspecting officer will pass down the ranks to see that the appointments, clothing, &c., are clean, and in good order.

Unfix Swords.

Shoulder-Arms.

For Inspection,—Port Arms.

Close Order—March.

Examine—Arms.

The company will then be told off and proved as follows :—

Number.—The men having numbered, *No.*—, *Left of the Right Half-company, Nos.* —, —, —, —, *left of Sections.*
Right Half-Company, Trail-Arms.
Left Half-Company. Trail-Arms.
Outer Sections, Order-Arms.
Inner Sections, Order-Arms.
Fours-Deep, Front.
Fours-Right, Front.
Fours-Left, Front.
Fours-About, Front.

The above method of proving should generally suffice. The company may further be proved, if considered expedient, in any particular movement in which it may be deficient.

Dismissing a Company.

(1.) Without Arms.

Right-Turn.—On the word "*Turn,*" the men will turn as directed.

Dismiss.—On the word "*Dismiss,*" the front rank will take a side pace to the left, and the rear rank will take a side pace to the right; after a pause the squad will break off quietly.

(2.) With Arms.

Right-Turn.—"*Dismiss.*"—On the word "*Dismiss,*" the whole will bring the carbines to "The Trail;" the front rank springing off to the left, the rear rank to the right; the men will then break off and quit the parade without noise.

Giving Points at Battalion Drill.

Base Points, and Markers.—In all deployments and formations of line, on any one company, a marker will be placed in front of each flank file of that company as a base. A marker will also run out from each of the other companies to mark the distance required for it, covering in the line established by the base points. All the markers will turn to the battalion point of appui, except the base points in specified cases.

The base points will invariably move out on the battalion caution, and remain steady until the whole line is formed, when the major who has covered them will give the word "*Steady,*" on which they will fall in their proper places; each of the other markers will run out to give his point when within 20 paces of his ground, remaining steady until the second company from him receives the words "*Eyes—Front,*" when he will fall in.

In wheeling, or forming, from column into line, in which case the companies move simultaneously, all the markers giving points will move out and take post, together.

Points to be kept clear.—As it is of great importance that the base points, and other markers, of a battalion forming line should be kept clear, companies must upon all occasions be halted in rear of them, and then dressed up into line.

WORDS OF COMMAND.*

Every command must be loud, and distinctly pronounced, so as to be heard by all concerned.

Every command that consists of one word must be preceded by a caution: the caution, or cautionary part of a command, must be given slowly and distinctly; the last or executive part, which, in general, should consist of only one word or syllable, must be given sharply and quickly; as *Company—Halt: Half Right—Turn.* A pause of slow time will invariably be made between the caution, or cautionary part of a command and the executive word.

When the last word of a caution is the signal for any preparatory movement it will be given as an executive word, and separated from the rest of the command by a pause of slow time; thus *Right—Form. Quick—March,* as though there were two separate commands, each with its caution and executive word.

When the men are in motion, executive words must be completed as they are commencing the pace which will bring them to the spot on which the command has to be executed. The cautionary part of the word must therefore be commenced accordingly.

Officers, and non-commissioned officers, should frequently be practised in giving words of command. It will be found a good plan to practise several officers, or non-commissioned officers, together in giving words of command, first in succession, then simultaneously; the time and pitch being first given by the instructor.

* (From "Field Exercises, &c., of Infantry," Squad Drill, Gen. Rule IV.)

CARBINE DRILL.*

Review Exercise.

At inspections or reviews the Manual and Firing Exercise will be performed in Quick Time. The men standing at "The Order" will be ordered to shoulder and take open order, after which the words of command will be as follows :—

Caution.—Manual Exercise.

1. Present—Arms.
2. Shoulder—Arms.
3. Support—Arms.
4. Shoulder—Arms.
5. Order—Arms.
6. Fix—Swords.
7. Shoulder—Arms.
8. Port—Arms.
9. Charge—Swords.
10. Shoulder—Arms.
11. Slope—Arms.
12. Shoulder—Arms.
13. Order—Arms.
14. Unfix—Swords.

Close—Order. March.

Caution.—Firing Exercise.

Fire a Volley.
At 300 Yards.
Ready. Present.
or,
Fire—Volleys.
At 300 Yards.
Ready. Present.
&c.
Stand at—Ease.

Note.—(The "Manual Exercise" also includes the following exercises (not performed at reviews). After "Unfix Swords" as above:—
Slope Arms—Order Arms—Trail Arms—Shoulder Arms—Trail Arms—Order Arms—Shoulder Arms—Sling Arms—Shoulder Arms—Order Arms—Ground Arms—Take up Arms—Stand at Ease.)

Motions of the Carbine performed on the March.

When soldiers standing in line with unfixed swords step off from "The Order" they will come to "The Trail" as they take the first step;—when standing in line with swords fixed, or in files, they will come to "The Shoulder;" returning, in each case to "The Order" when they halt or halt and front;—when march-

* From R.A. Manual of Carbine Exercises

ing in line or to a flank in fours with trailed arms, and ordered to turn into file, or form two deep, they will come to "The Shoulder" as they turn or form, and will trail again on turning from file into line, or forming fours;—when they halt and front from file they will order.

When soldiers standing with shouldered arms receive the command "*Slow* (or *Quick*) *March*," they will step off, remaining at "The Shoulder."

The method of taking open order for "Manual Exercise" at Reviews or Inspections, as laid down in Infantry Field Exercise, 1870 and 1874, is as follows:—

For Manual Exercise, "*Open—Order.*"—"*March.*"— On the word *Order*, the right guides will fall back into the supernumerary rank (which will step back two paces as usual), their markers replacing them; the captains will step back with the supernumerary rank. On the word *March*, the rear ranks will step back two paces as usual.

Paying Compliments with Arms.

When a non-commissioned officer, or soldier, passes or addresses an officer, he will do so at "The Shoulder," with the left arm brought across the body, and the hand, fingers extended, meeting the sling of the carbine in line with the right elbow.

Piling Arms.

"*Pile.*"—On the word "*Pile*," the rear rank will take a pace of nine inches to the rear, and the front-rank men will draw back the right foot ready to turn to the right about.

"*Arms.*"—On the word "*Arms,*" the front rank will turn about bringing their carbines with them at the short trail; the whole will then place the butts of their carbines between their feet, locks from them; after which the right file rear rank and the left file front rank will incline their carbines towards each other, and cross rods. This done, the front-rank man of the right file will, with his left hand seize the carbine of the front-rank man of his left file by the muzzle, bearing it from him, and with his right hand lock rods by passing his own by the left of the rods and to the right of the muzzles of the other carbines; lastly, the left file rear rank will lodge his carbine between the muzzles of the carbines of the front rank, sling uppermost. When there is an odd file, each man of the file will lodge his carbine against the pile nearest his right hand.

"*Stand-clear.*"—Ranks will step back a pace of nine inches, and turn to the directing flank.

"*Stand-to.*"—Ranks will turn inwards, and close on their arms by taking a pace of nine inches forward.

"*Unpile.*"—On the word "*Unpile,*" seize the carbine with the right hand under the top band, the front-rank men at the same time drawing back their right feet ready to turn to the right about.

"*Arms.*"—On the word "*Arms,*" unlock the rods without hurry, by inclining the butts inwards, and come to "The Order." The front rank will then *front*, and the rear rank close on it by taking a pace of nine inches forward.

In piling arms on parade, the word "*Break-off*" will be given after "*Stand-clear.*" On again falling in, the men will place themselves as they stood before breaking off.

Preparing for Cavalry.

"*Prepare for Cavalry.*"—If the square is four deep, the second and fourth ranks will take a pace of nine inches to the front. The first and second ranks will then sink upon the right knee, but without bringing the weight of the body on the heel (the right knee of the second rank to be twelve inches to the right when on the ground); and, at the same time, place the butts of their car-

bines on the ground against the inside of their right knees, locks uppermost, with the muzzles slanting upwards so that the point of the sword may be about the height of a horse's nose : the left hand to grasp the carbine firmly immediately above the lower band, the right hand to hold the small of the butt, the left arm to rest upon the thigh about six inches from the knee.

The third rank will come to the "Ready position" (the muzzles of the carbines to be slightly inclined upwards).

When men standing with unfixed swords are ordered to prepare for cavalry, they will at once fix, then proceed as above described.

If the square is required to fire, unless it is intended to fire from all faces of the square at once, the caution—"*Face* (or *Faces*)" will precede the caution to fire.

—*Rounds, Independent firing. At—yards. Ready. Commence. Cease Fire*, or, *Fire a Volley. At—yards. Ready. Present.*—The third rank of each face, or of the named face (or faces), will proceed as before detailed. Any face of the square that may not have been required to fire will order at the same time as the remainder.

Kneeling Ranks, (or, *Kneeling Ranks of the—face*, or, *faces*)—*Fire a Volley.*—This caution to be given, should be deemed necessary for the front kneeling rank to fire a volley.

At—yards. Ready.— As before detailed : and bringing the weight of the body on the right heel.

Present.—As before detailed : then bring the carbine again to resist Cavalry.

Order-Arms.—As before detailed.

If considered expedient, the front standing and kneeling ranks may fire volleys alternately ; time being allowed between the rounds for the smoke to clear away.

Carbine Exercise for Sergeants.

Sergeants, when moving with their companies or with the battalion, will remain with unfixed swords, except while in a square, in which case they will have their swords fixed.

Sergeants will stand at ease and come to attention with the men, they will also shoulder arms, slope (or trail) arms, and order arms with them. The sergeants, during the performance of the Manual and Firing Exercises by the rank and file, will remain steady at The "Shoulder."

Recover—Arms.

The Recover.—Sergeants will recover arms as follows:—Seize the carbine as directed in the first motion of "The Present Arms." then raise it perpendidularly in front of the face, right hand grasping the small of the butt, thumb as high as the mouth, barrel to the front, at the same time place the left hand under the butt, thumb in front of the heel, first two joints of the fingers round the side of the butt.

While a sergeant marking a point in a line formation is extending an arm, he will hold his carbine by the small of the butt with the other hand, resting the toe against his chest.

Instructions for Cleaning the Carbine.

1. Half-cock the carbine, and open the breech.

2. Put a piece of rag into the jag of the cleaning rod, twisting it round so as to cover it, and rub the barrel carefully up and down with it to remove the fouling. No water is to be used except after firing blank cartridge. In this case the carbine is to be held muzzle downwards at a convenient angle, with the breech-block open, and water poured through the barrel. without, however, wetting the breech-block, or other parts of the breech arrangement. A wetted rag is then to be placed on the muzzle and pressed into the bore with the head of the rod, care being taken that the head is covered. Should the rod stick fast in the barrel, no attempt is to be made by the soldier to drag it out by extreme force, but the armourer is to be called upon to remove it.

3. Replace the afore-mentioned rag by an oil rag, woollen if possible, and pass the latter a few times up and down the barrel.

4. Wipe the breech-shoe and breech-block all over with an oil rag, to remove dirt and prevent rust.

5. Close the breech, and ease springs.

GUARDS.*

Relieving Guard.

New Guard, Halt—Dress. Open Order. March.—The new guard, with bayonets fixed will be halted about fifteen paces from the old guard, dressed, and directed to take open order.

Old Guard, Present Arms.—The old guard, drawn up at open order on its parade, will receive the new guard with the prescribed salute.

New Guard, Present—Arms.—The new guard will return the salute.

Old Guard, Shoulder—Arms. New Guard, Shoulder—Arms.—After which, both guards will be ordered to shoulder, and the commander of the old guard will hand the duplicate of his guard report to the commander of the new guard.

Old Guard, Order—Arms. Stand at—Ease. New Guard, Order—Arms, Stand at—Ease.—The guards will order arms and stand at ease.

The guard will then be told off, and the first relief sent out; while the relief is going round, the commander will take over the property in charge of the guard, according to the list in the old guard report.

Old Guard, Attention. Shoulder—Arms. New Guard, Attention. Shoulder—Arms.—When the reliefs have returned, and all the men of the old guard have fallen in, both guards will be called to attention, and ordered to shoulder arms.

Old Guard, Close—Order. March.—The old guard will then take close order.

Old Guard, Fours—Right, or *Left* (or *Right,* or *Left—Turn*) *Quick—March. New Guard, Present Arms.*—The old guard will form fours (or turn) to the right or left, and march off, the new guard presenting arms.

* From Field Exercises and Evolutions of Infantry.

New Guard, Shoulder—Arms. Close—Order. March.—When the left, or right, of the old guard is clear of the ground on which it stood, the new guard will shoulder arms and take close order. *Guard, Fours—Right. Left—Wheel. Quick—March. Left—Wheel.*—The new guard will form fours to the right and wheel to the left; when its leading files arrive at the left of the ground on which the old guard was formed, it will again wheel to the left.

Halt—Front. Dress. Order—Arms. Stand at—Ease. Attention. Shoulder—Arms. Right—Turn. Dismiss.—When the new guard is on the ground which was occupied by the old guard, the commander will order it to halt, front, order arms, and stand at ease. He will then read the orders of the guard to his men, after which he will dismiss them in the usual manner; when the first relief comes in, the orders must be read to the men who have been on sentry.

In situations where the new guard cannot advance in line towards the front of the old guard, it will move up in fours, or files, and will be halted and fronted opposite to the latter, or if necessary on its left, in the same line, leaving an interval between them of four or six paces.

Marching Reliefs.

Reliefs of less than four men will be formed in single rank, when of four men, or upwards, they will be formed in two ranks, and may be marched in line, on open ground; but in streets, or in narrow places, reliefs should always be marched in single rank, or files. When marching in line, the corporal will be on the right of his relief; when in single rank or files, he will be on the proper front of the rear file; he will carry his arms advanced, with his bayonet fixed.

When the first relief of a new guard is sent out, a corporal belonging to the old guard will accompany it, to bring in the relieved sentries. If the relief moves in line, he will be on the left flank; if in single rank or files, he will be in front, leading

the single rank, or front rank of files. As soon as all the sentries are relieved, the corporals will change places, and the corporal of the old guard will take command.

Relieving or Posting Sentries.

On the approach of the relief, a sentry will place himself with shouldered arms in front of his sentry box. The corporal of the relief will proceed as follows:—

Shoulder—Arms.—At about ten paces from the sentry.

Relief—Halt.—At about six paces from the sentry.

Sentries, Port—Arms.—The old sentry, and the man who is to relieve him, will port arms, the latter moving out from the relief and placing himself at one pace from the former, turning towards him; the old sentry will then give over his orders, the corporal referring to the board of orders to see if they are correctly given.

Pass.—On this word, the old sentry will take one pace to his left, and then move to his place in the relief, turning to the rear, and the new sentry will take one pace to his front.

Shoulder—Arms. Front. Relief, Quick—March. Support—Arms.—The relief will be marched on, and when it has proceeded about ten paces will be ordered to support arms.

The proper front of a sentry's post, and the extent of his walk, should be pointed out to him when he is posted.

Sentries walking backwards and forwards on their posts, must do so in a brisk and soldier-like manner; they must on no account quit their arms, lounge, or converse with any one, nor must they stand in their sentry boxes in good or even in moderate weather. Sentries are permitted to support arms (or to sling, or trail, with the short rifle), or to order their arms and stand at ease; but they are not to slope them unless specially allowed to do so.

Sentries paying Compliments.

On the approach of an officer, when he is at least fifteen paces distant, a sentry, if on the march, will halt, front, and shoulder

arms; if standing at ease with ordered arms, he will come to attention and shoulder. To field officers and other officers of the army and navy entitled to the salute, he will present arms.

To all armed parties, whether they are commanded by an officer or not, a sentry will present arms, and the party will return the compliment, when marching at the slope or support, by shouldering arms, but when marching at the trail, by shouldering arms. Parties with side arms are to be considered as armed parties.

To all unarmed parties a sentry will shoulder arms, unless they are commanded by field officers, in which case he will present; in return, the commander of the party will give the word *Eyes right*, or *Eyes left*, as the case may be, and having passed him, *Eyes front*.

Parties marching with arms at the secure, and parties with side arms, will pay and return compliments as unarmed parties.

Sentries will not present arms to any officer after sunset; but as long as they can discern an officer, they will come to their front on his approach, and stand steady with shouldered arms till he has passed.

Sentries in their sentry boxes will salute by coming smartly to attention.

Sentries Challenging.

When it gets dark, the sentries will challenge in the following manner:—On the approach of any person the sentry will port arms and call out in a sharp tone, *Halt. Who comes there?*, when on a post where a sudden rush could be made upon him, he will at once come to the charge; if the person approaching gives a satisfactory reply, the sentry will say *Pass friend: All's well*, remaining at the port or charge, till he has passed. If the person approaching answers ROUNDS, the sentry will demand *What rounds?* and after the reply GRAND (or VISITING) ROUNDS, when there is no countersign, he will say *Pass grand* (or *visiting*) *rounds All's well*, shouldering his arms at the same time, and presenting

as they pass if they are grand rounds; but when there is a countersign he will say *Stand grand* (or *visiting*) *rounds*: *Advance one and give the countersign*, at the same time coming down to the charge; in this position he will receive the countersign, and if it is correct will say *Pass grand* (or *visiting*) *rounds*, and proceed as above described.

If the sentry is on or near the guard room door, he will proceed as described below, in directions for "Guards Turning out."

Guards Turning Out.

When guards turn out they will fall in with shouldered arms at open order, and will pay the compliments laid down in the "Queen's Regulations;" guards will not turn out after sunset, except on the approach of a body of troops, in cases of alarm, or to receive grand or visiting rounds.

The following form will be observed when a guard is visited by the field officer or captain of the day, called grand or visiting rounds. On the approach of the rounds the sentry at, or near the guard-room door will port arms, and challenge, "*Halt. Who comes there?*" the officer will answer, GRAND (or VISITING) ROUNDS, as the case may be, and the sentry will call out "*Guard turn out.*" The guard will then turn out, and if there is no countersign, as soon as it has fallen in, the commander will call out "*Advance grand* (or *visiting*) *rounds*: *All's well*"; to grand rounds he will present, to visiting rounds he will remain at the shoulder.

If there is a countersign to be given, a corporal or sergeant will be sent out with the right, or left, file of the guard, according to the position of the rounds; he will move next to the front rank man; when at about ten paces from the rounds he will order his men to halt and port arms, and will then repeat the challenge "*Who comes there*"? GRAND (or VISITING) ROUNDS. "*Stand grand* (or *visiting*) *rounds*: *Advance one and give the countersign*"; the officer, or the non-commissioned officer accompanying the rounds, will then advance and give the countersign, the two men of the file charging bayonets as he advances; the non-commissioned officer

of the escort will go back and repeat the countersign to the commander of the guard, who (if the word is correct) will call out, "*Advance grand rounds* (or *visiting rounds*): *All's well.*" The non-commissioned officer of the escort, having returned to his men, will then order them to shoulder arms, turn inwards, and step back three paces each. The rounds will pass between them. If they are grand rounds, the escort will be ordered to present; the guard will also present to grand rounds as they approach. As soon as the rounds have passed, the escort will be ordered by a non-commissioned officer to shoulder (if they have presented), turn inwards, march back, and fall in on the flank of the guard, taking up "the present arms," if the rest of the guard are at the present; the guard will then be dismissed.

DUTIES OF GUARDS.*

Duties of Commanders of Guards.—Commanders of guards are to make themselves thoroughly acquainted with all the orders for their guards, as well as with those on each sentry's post. The standing orders of the guard are to be distinctly read and fully explained to the men, as soon as the guard has mounted. Every relief is to be regularly inspected before going to, and also on returning from, their posts.

Going rounds.—Commanders are to go their rounds at least twice by day and twice by night; and, in addition, a non-commissioned officer with a file of men, is frequently to visit the sentries, in order to ascertain that they are acquainted with their orders, and are carrying them out in a proper manner. The greatest vigilance is to be exercised by commanders, as well as by non-commissioned officers of guards, to ensure a correct and exact performance of all duties on the part of those under them, and to prevent drinking and all other irregularities.

Officers and men not to quit their guards.—Commanders are never to quit their guards, except for the purpose of visiting their sentries, and they are then to inform the next in command of their intention and the probable time of their absence. They are also to prevent any non-commissioned officer or soldier from quitting the guard without leave, which is to be sparingly granted, and only for special purposes.

Guards not to take off clothing.—Night duties.—Neither officers nor soldiers are, on any account, to take off their clothing or accoutrements while on guard. They are to be at all times alert and vigilant in the performance of their night duties, and to be ready on all occasions to furnish patrols, both of cavalry and infantry, on the requisition of constables and other peace officers, who state their belief that there are persons engaged in the commission of burglaries or other depredations in the vicinity of their post.

* From Queen's Regulations.

Guards to turn out at reveille, retreat, and tattoo. — All guards are to turn out with "supported" arms at the commencement of the *Reveille*, *Retreat*, or *Tattoo* sounding, when they are to be carefully inspected by their commanders, whose duty it is to ascertain that all the men are present and regular in every respect.

Relief of sentries.—Sentries will be relieved every two hours; and during the continuance of cold or inclement weather in winter, they may, at the discretion of the officer commanding the garrison or camp, be relieved every hour during the night.

Fire or other alarm.—When a fire breaks out or any alarm is raised, all guards are to be immediately under arms, and so continue until the fire is extinguished, or the cause of alarm has subsided.

Guard reports.—In their guard reports, which are to be made on W.O. Form 1036, commanders are to mention the particular hours at which they went their rounds, as well as the hours at which their guards were visited by officers on duty, and by "rounds," of any description. They are also to send an immediate report, to the field officer or captain of the day, of any unusual occurrence that may happen on or near their guards.

Inspection of guards on being dismounted.—All guards on dismounting are to be marched with the utmost regularity to their regimental parades, where they are to be inspected and their arms examined. If the guard be in charge of a non-commissioned officer, and no officer is present on the parade, a report is to be made to the adjutant or orderly officer previous to dismissal.

Commanders responsible for stores, &c.—All stores and furniture (including the sentry-box watch coats) in charge of a guard are to be handed over from one commander of a guard to another. The officer or non-commissioned officer commanding the relieving guard will be responsible for their correctness, and will certify in his report to the state of each article when taken over.

Honours and Salutes.*

Guards are at all times to turn out and pay the compliments to General officers in uniform.† General officers meeting guards on the march are also entitled to the usual salute in passing.

To regimental commanding officers—irrespective of their army rank—their regimental guards are to turn out, and present arms, once a day, after which they are to turn out to them with shouldered arms. To regimental field officers not commanding, regimental guards are to turn out with shouldered arms, once a day. Regimental guards or armed parties meeting the commanding officer of the corps are to salute him in passing.

When General officers in uniform, or persons entitled to a salute, pass in rear of a guard, the officer in command is to cause his men to fall in and stand with shouldered arms, facing to their proper front; but no drum is to beat or bugle to sound. When such officers pass guards while in the act of relieving, both guards are to salute, receiving the word of command from the senior officer present with them.

When garrison or other guards proceeding to or from their posts meet the field officer of the day, they are to salute him in passing.

Guards are to get under arms at all times when armed parties (including militia or volunteer corps) approach their posts;—and when such parties are commanded by officers they are to present arms and beat a ruffle or sound a flourish, officers saluting, but they are not to pay compliments nor to turn out as a matter of compliment after the retreat has sounded. Guards should stand to their arms while unarmed parties commanded by officers pass their posts. Standards, guidons, or colours, passing a guard are to be saluted with the utmost respect, the trumpets or bugles sounding a flourish and the drums beating a ruffle.

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* From "Queen's Regulations."

† Officers saluting, arms presented, trumpets or bugles sounding the "flourish," and drums beating the ruffle.

All guards and sentries are to pay the same compliments to the officers of the royal navy and marines, to officers of militia, and to officers of volunteers holding commissions, when in uniform, as are directed to be paid to officers of the army.

Duties in Garrison.*

The ordinary duties of the field officer of the day are,—to be present at general guard mounting, to visit all guards by day and night, and to turn out and take command of the piquets in case of fire, riot, or other alarm. In the morning, on the dismounting of the guards, the reports of their Commanders are to be forwarded by the field officer to the Governor, Commandant, or other authorised staff officer, together with his own report, in which he is to note any irregularity or occurrence of an unusual nature that may have come under his observation in the course of his duty.

In small garrisons, a captain is to do the duty of the field officer of the day, in the same manner in all respects, except that his being mounted may be dispensed with. In large garrisons, when the guards are numerous or widely distributed, a captain as well as a field officer of the day may be detailed, and the former, at the discretion of the Commandant, may be directed to perform a portion of the field officer's duties.

Duties in Camp.*

The field officer of the day has the general superintendence of the camp of the brigade; he is to be present at the mounting of all the brigade guards, which he is to visit by day and night. The inlying piquets are always to be considered under his immediate command; he is to call them out, to inspect them, to order such patrols from them as he may judge necessary to insure the regularity and order of the camp, and in the event of their being ordered out of camp on any duty, he is to accompany them.

The captain of the day is to superintend the cleanliness and regularity of the camp of his own regiment; to attend the parading of all regimental guards; to visit them by day and night; and to report everything extraordinary to the commanding officer.

* From "Queen's Regulations."